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CHANGE RECORD

Issue	Date	Sheet	Description of Change	Release
1	AUG. 01	ALL	FIRST ISSUE OF THE DOCUMENT	---
2	SEP. 01	ALL	INSERTION OF SOFTWARE INFORMATION	
3	Dec. 02	ALL	REVISION OF SOFTWARE AND AIRSAMPLER SECTIONS WITH UPDATED INFORMATION ON BACKUP AND USERS POLICY. MEASUREMENT SYSTEM SECTION AND OPERATIONAL PROCEDURES INSERTED	
4	APR. 03	Sect.1.2	Replaced "DSPEC"+ with "DSPEC^{Plus}"	
			Made the terms in the paragraph consistent with the ones in the figure.	
			Replaced "station" with "system".	
		Sect. 2.1	This section was 3.1 in issue 3	
			Replaced "particulate collection" with "air sampling".	
			The statement referring to air-sampler autonomy changed as requested.	
			"analysed" substituted and the last statement removed, as required	
			"storage" replaced "archiving"	
			Removed "that"	
			In table 1 (table 4 in previous issue): ▪ removed " inside the lead shield" and changed "shields" into "shield" ▪ "Archiving" changed into "Storage" ▪ Substituted "and archives the samples at the station for future investigations" with the required statement. ▪ Added the last step	
			Modified the statements after table 1 (table 4 in previous issue)	
		Sect. 2.2	This section was 3.2 in issue 3	
			"MANUAL" and "AUTO" swapped	
			"switching" replaced "passing"	

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		Sect. 2.3	This section was 3.3 in issue 3	
			Removed "CLEAN AREA" related information as required	
		Sect. 2.4	This section was 3.4 in issue 3	
			"Reduced decay time" changed to "Reduced Sample Cycle" as required	
		Sect. 3	This section was 4 in issue 3. Section title changed as required	
		Sect.3.1	This section was 4.1 in issue 3.	
			"hart" changed to "heart".	
			Removed "properly" as required.	
			Modified the last statement as required.	
		Sect.3.3	This section was 4.3 in issue 3.	
			Changed the first statement and deleted the last one as required.	
		Sect.3.6	"certificate" changed into "certificate file"	
		Sect.4.3	This section was 2.2 in issue 3 (In issue 3 this was section 4)	
			For the sake of readability, all sub-sections addressing individual blocks changed position in order to mirror the block presentation list. Figure numbering followed the change.	
			Corrected Operator I/F and MMI.	
			Specified user-group as NT one and removed "related".	
			Re written statement about Environment Status Area.	
			"Tampering Sensor" changed into "Tamper Sensor"	
			"detector acquisition" changed into "gamma acquisition"	
			Modified the last sentence between figures "The Main area" and "Station Computer window (…)" as required.	
			Modified the last sentence between figures "ORTEC Detector window" and "Air Sampler window" as required.	
		Sect. 5.1	Re-written as required.	
		Sect.5.2	"extracted" changed in "removed by"	

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			"tampering sensor" changed in "tamper sensor"	
		Sect.5.4	"are exposed" changed in "can be exposed"	
			Removed "after any strong meteorological event" as required	
		Sect.6.1	"Cause" changed in " "Possible cause"	
			"24h cycle" changed in "48h cycle"	
		Appendix A	This section was 3.3 in issue 3	
			Modified the action list in the first sub-section	
			Description of figure 24, 25, 26 and 27 (former 22, 23, 24 and 25 in issue 3) changed as required.	
			Description of figure 30 (former 28 in issue 3) changed as required	
			Figure between 30 and 31 (former 29 in issue 3) has been deleted as required.	
			Figure 31 (former 30 in issue 3) and the related label changed.	
			Figure 32 (former 31 in issue 3) related label changed.	
			Modified a statement in "Labelling the filters"	
			Removed section "On site sample storage" as required	
		Appendix C	(Appendix A in issue 3) "beacker" changed in "beaker", "multiline" in "calibration", and "clik" in "click"	
		Appendix E	(Appendix C in issue 3) "chose" changed in "choose", "beacher" changed in "beaker", and "measure" changed in" measurement"	
		Appendix I	(Appendix F in issue 3) removed the blank line	
5	SEPT. 03	Appendix C	Calibration Procedure modified as required for CTBTO's comments in fax Ref:Call-off Contract#00/20/6006 30 July 2003	
		Appendix D	Blank Filter Procedure modified as required for CTBTO's comments in fax Ref:Call-off Contract#00/20/6006 30 July 2003	
		Appendix L	New procedure relevant to filter tray block as required for CTBTO's comments in fax Ref:Call-off Contract#00/20/6006 30 July 2003	

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

Purpose of this document is to explain how to use the Radionuclide Monitoring Station (RMS). It is intended both for operational and training purposes. It also contains operative procedures for non-routine operations such as background, calibration, system backup and recovery, etc.
Reader of this document should have basic knowledge of main station functions.

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1.2. SYSTEM OVERVIEW

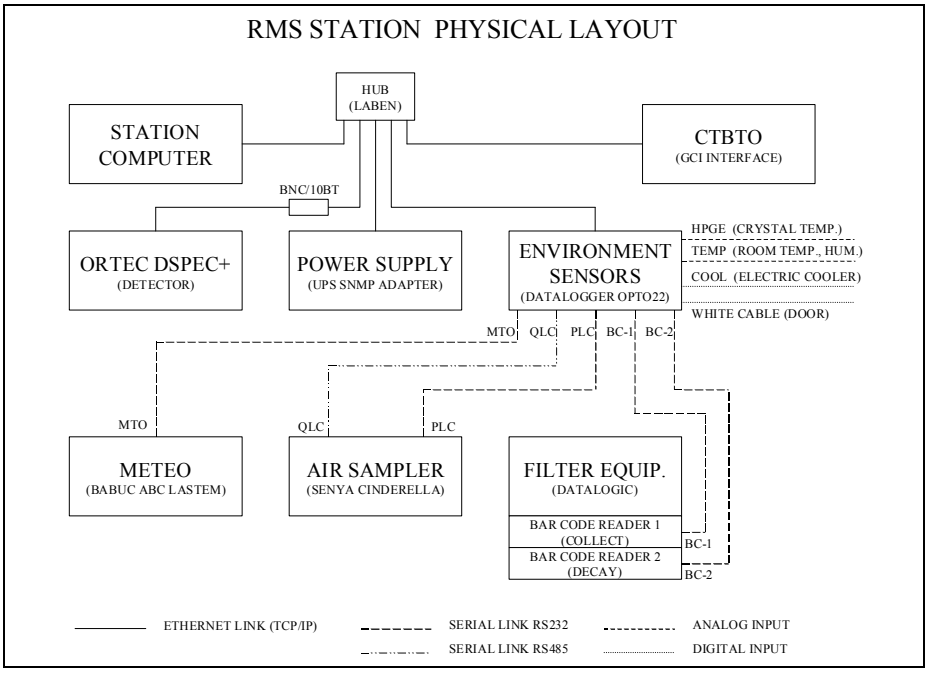
The RMS is composed of the following main blocks :

- Air-sampler
- Nuclear measurement system (DSPEC^{Plus}, Detector)
- Metereological measurement system
- Data Management system (PC, UPS controllers, Datalogger, Ethernet Hub)

The Data Management System is made of the following elements:

- Station Computer (a Personal Computer);
- UPS (Uninterruptable Power System)
- Datalogger
- ETHERNET Hub.

The Station Computer interfaces with the other elements of the system to acquire data relevant to both the measurements (nuclear and meteorological) and the health of each component of the station.
The data links at the station are established mainly through ETHERNET LAN, but Serial communications are also used.
Data acquired are stored locally and sent to the International Data Center in Vienna via a satellite link (GCI) or (when available) through network infrastructures present at the site.



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Radionuclide station: equipment Rack layout

GPS clock

Station computer

Multichannel Analyser (DSPEC plus)

Cooler power control unit
UPS controllers

Cooler Unit

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2. AIRSAMPLING SYSTEM

2.1. OVERVIEW

The automatic airsampler system takes care of the air sampling, sample preparation and manipulation. The system can manage a maximum of 14 samples that means an autonomy of 14 days (with the nominal production rate of one filter a day).
The filter is exposed to a forced airflow for a period of 24 hours. After the exposure the filter is automatically removed, cut, put in decay for 24h, put 24 hours on an HPGe detector for gamma analysis and stored.
There are four stages organised in a pipeline process: sample, decay, measurement and storage (see Table 1). The various stages, from filter preparation to local storage, occur over a period of three days (24+24+24=72 Hours).
The pipelined operation allows the airsampler to operate in continuous mode: each time a step is completed for the n^{th} sample, it begins for the sample n+1.

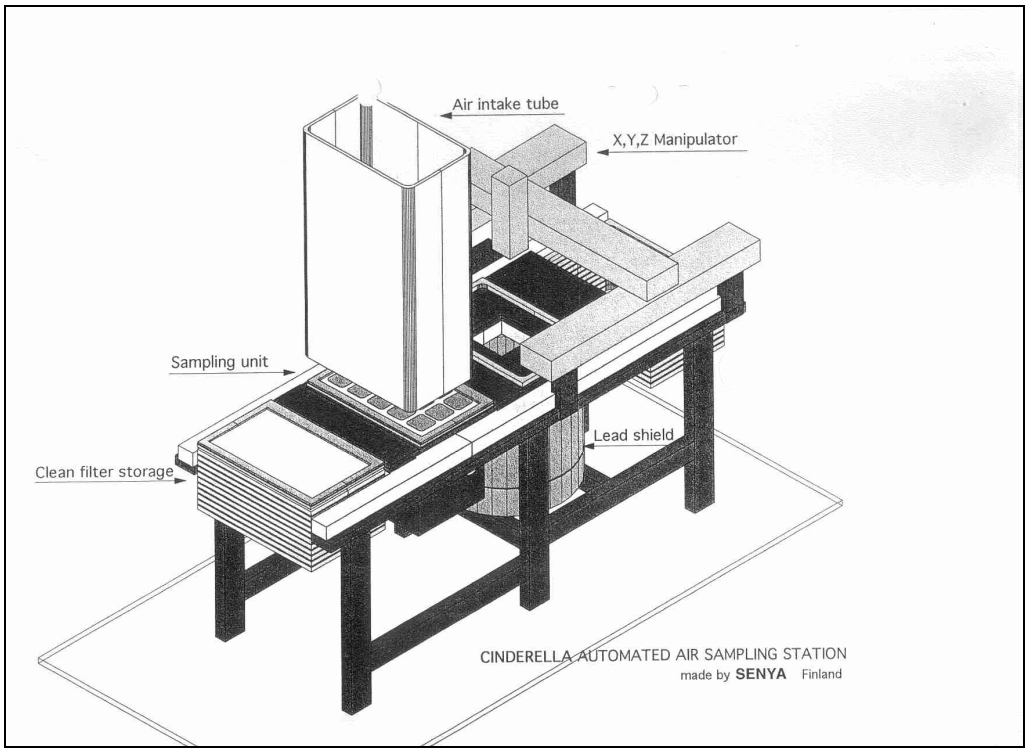

Figure 1. Air sampler scheme.

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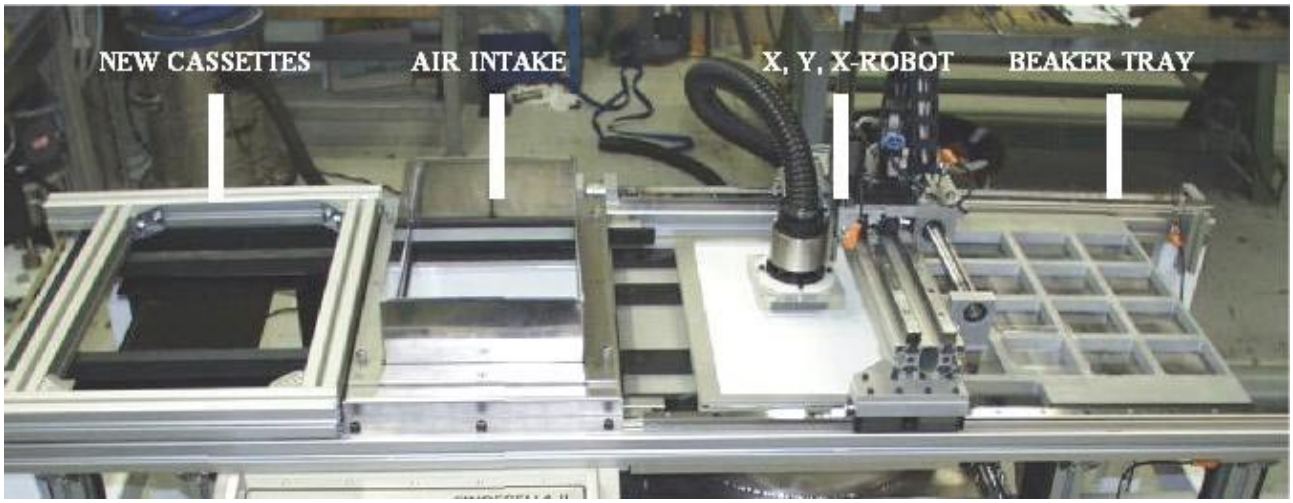

Figure 2. The different parts of the airsampler.

For a more exhaustive description of the airsampler machine please refer to the Cinderella user manual.

Step	Description
Sample acquisition	The filter is moved from the new cassette tray and placed under the air flow, where it remains for 24 hours.
Cutting process	After the collection period, the filter cassette is moved out of the air flow and the filter is cut in 15 square pieces by the robotic arm. The filter pieces are placed in a plastic container.
Decay period	The sample undergoes a decay period of 24h between sample acquisition and analysis to allow the decay of naturally occurring radionuclides.
Spectrum acquisition and Quality Check	The sample is put on the detector by the robotic arm. It will remain there for the 24h acquisition period. Before sample acquisition starts, a 15 minutes quality check spectrum is acquired. The QC source is placed outside the lead shields so that when they close the source is shielded and the sample measurement can begin.
Archiving	The analysed sample is moved from the detector to the storage position inside the airsampler and remains there until the 14-days automatic cycle is over. Then the operator unloads the airsampler puts the samples into the local storage until they are shipped for archiving to the PTS.
Loading a new filter cassette	Load a new filter cassette

Table 1. Process steps.

The system is fully automated so it does not take the continuos presence of an operator.

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Operator shall check periodically the logged data and the station status. On failure occurrence the operator shall notify the Control Centre with the maximum urgency.
The system has an autonomy of 14 days. After such a period, the used filter cassette must be unloaded and the samples archived at the station. Afterwards the 14 filter cassettes must be prepared with new filter sheets and loaded in the airsampler.

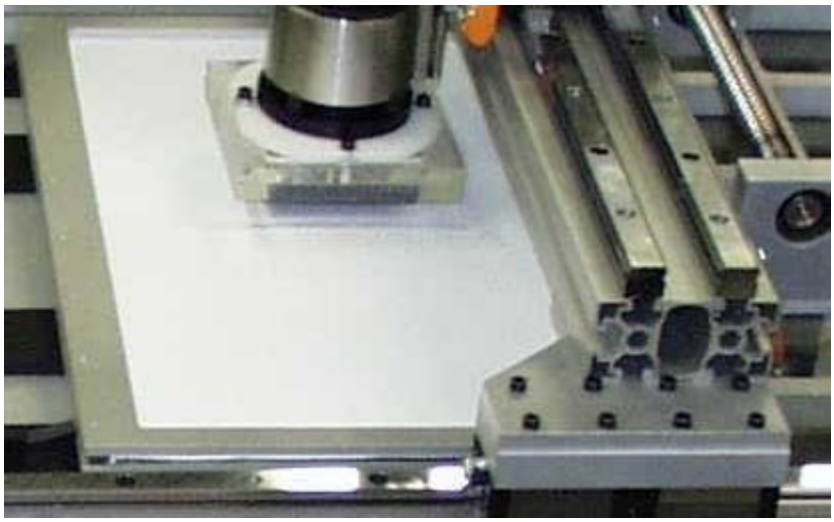

Figure 3. Fibreglass filter ready to be cut by the robotic arm.

The airsampler is provided with two bar code readers: one is located in the new filter cassette tray (sample ID) to read the filter ID when the cassette enters the sampling position, the other one is mounted inside the Plexiglas cover (decay ID) and reads the ID before the filter is cut and placed in decay. The last codes acquired by these devices can be monitored in the Operator Interface opening the “Filter Equipment” window.

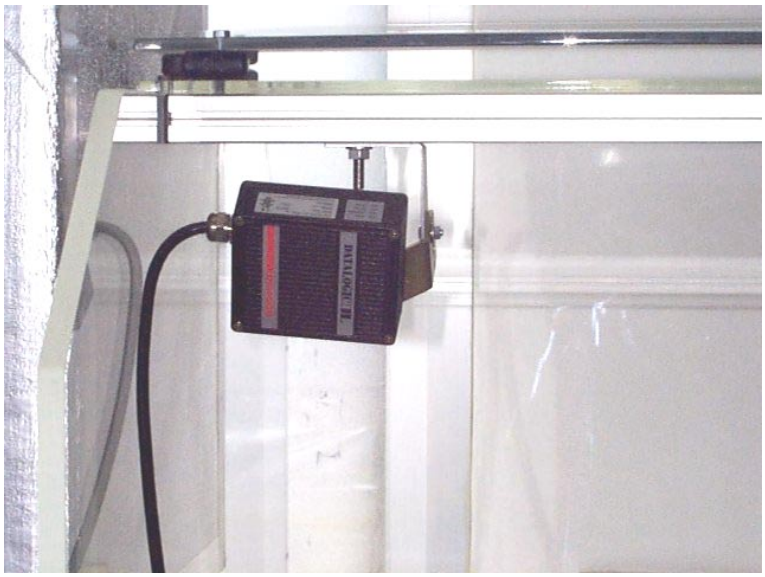

Figure 4. The second bar code reader.

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Figure 5. The Bar code reader location inside the Plexiglas box of CINDERELLA.

2.2. AIRSAMPLER CONTROLS

This section gives a basic introduction to airsampler control panel, for a complete description refer to the airsampler documentation.
The airsampler is controlled through a panel with a display and six function keys F1 to F6 (figure 6).
The alphanumeric display shows system status and errors (if any). If an error condition occurs, a red led blinks; if a more serious fault occurs the led goes on fixed.
The green led indicates system running mode AUTO (fixed) or MANUAL (blinking). In the automatic mode, the airsampler performs the sampling cycle as explained in table 1 at regular intervals. In manual mode the automatic filter management is suspended and some operations can be performed manually using the function keys.

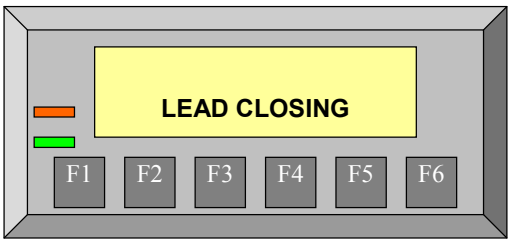

Figure 6. Airsampler control panel.

To switch between auto and manual modes press F1. Before switching to automatic mode the pump must be started.
The available functions depend on the system status (MANUAL/AUTO) and are described in table 2.

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Key	When in AUTOMATIC…	When in MANUAL…
F1	Switch to manual	Switch to automatic (the pump must be on)
F2	Select cycle time: 1h, 6h, 24h. When 1h is selected, filter cutting and manipulation are not performed	Open/Close the lead shields
F3	none	Start/Stop the pump
F4	(press shortly) Short system reset (press longer) Long system reset	Same as automatic
F5	Forced cassette change: filter cutting and manipulation are performed	Forced cassette change: filter cutting and manipulation are NOT performed
F6	Set system time and cutting time	Same as automatic
(*) For short and long reset detailed description refer to the airsampler documentation.		

Table 2. Control panel functions.

2.3. FILTER CASSETTE LOADING/UNLOADING

The most important routine operation is the change of the filter cassettes. The operator unloads the analysed samples, archives them and loads the filter cassettes with new filters sticking the bar code labels. The operation is scheduled every fourteen days.
Refer to APPENDIX A: Filter Cassette Loading/Unloading for the relative procedure.

2.4. REDUCED SAMPLE CYCLE

The reduced decay period for air filters has to be done on specific request. It can be done by selecting the 6h option on the cinderella PLC display, obtaining a 6 hour reduced decay period timed by Cinderella logic. Alternatively reduced decay periods different from 6 can be performed with the intervention of the operator who takes care of timing (see APPENDIX B: Reduced decay time).
The airsampler can support three different time cycles using the automatic mode. These are 1h, 6h and 24h selectable through F1 key. When in 1h mode the filter cutting is not performed, this mode of operation is intended only for testing purposes, not as a reduced cycle time. Note that in 6h and 1h modes, the change time is not started at fixed times like T_0, T_0+6h, T_0+12h… (or T_0, T_0+1h, T_0+2h…) Instead the next filter change happens 6h (or 1h) after the end of the previous change (the changing operation may take few minutes).

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3. GAMMA SPECTROSCOPY SYSTEM

3.1. OVERVIEW

The heart of the gamma spectroscopy system is the high purity germanium (HPGe) crystal detector. The detector is housed inside the airsampler surrounded by the lead shield. The shield has a moving top which allows to access the detection chamber to place the sample for analysis.
The detector crystal needs to be cooled at about –170°C and biased with high voltage in order to work. The cooling system is controlled by the Electricool device situated inside the rack. The DSPEC Multi Channel Analyser (MCA) performs also spectrum acquisition, the communication with the PC and provides the high voltage to the detector.

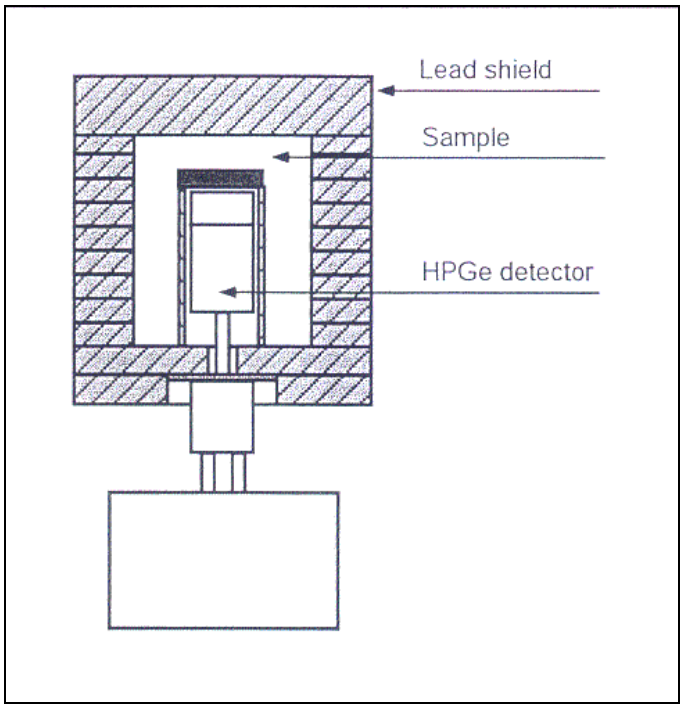

Figure 7. The HPGe detector inside the lead shield.

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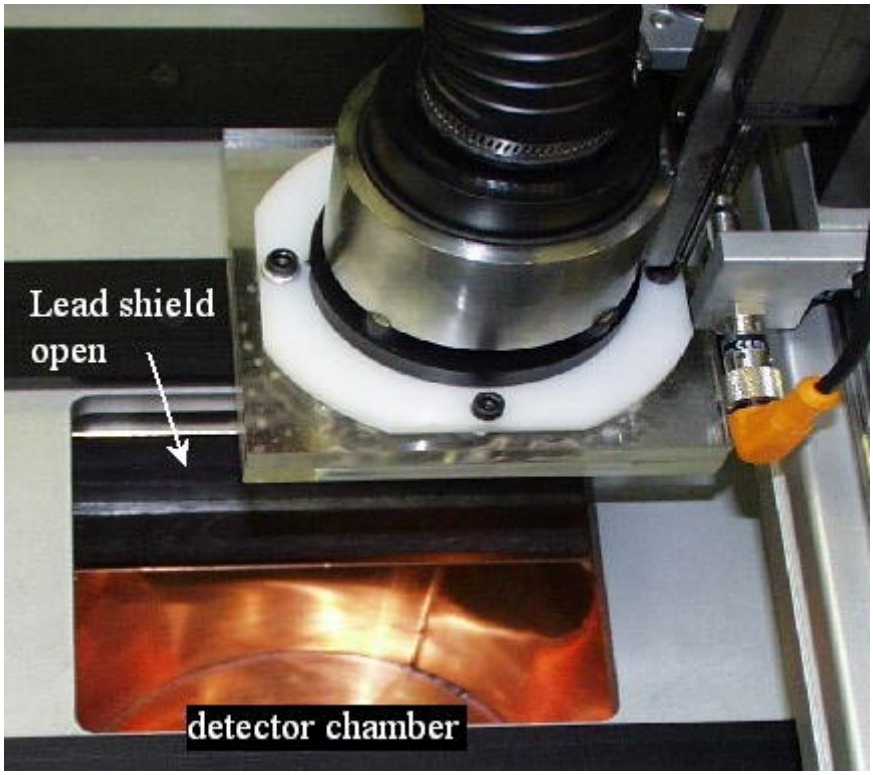

Figure 8. The detector chamber can be accessed by opening the moving top of the lead shield.

3.2. GAMMA VISION SOFTWARE

Gamma Vision is the spectrum acquisition and analysis software, it is also the control interface for the MCA device.
Gamma Vision can be started by the administrator account from Start menu – Programs – Gamma Vision.
Please refer to Gamma Vision manual for a complete description of this software.

3.3. DETECTOR CALIBRATION

Detector calibration is of major importance to ensure meaningful information about the radioactivity in the sample spectra. It should be performed whenever the measurement system configuration is changed and according to the Station Specific Operation Manual.
The calibration procedure is reported in APPENDIX C: Calibration procedure.

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3.4. BLANK FILTER SPECTRUM

This procedure consists of acquiring a spectrum from a blank sample which was not exposed to airflow. It is performed at station installation or on specific request.
The blank filter procedure is reported in APPENDIX D: Blank filter procedure.

3.5. BACKGROUND SPECTRUM

The background spectrum is a 7 days long acquisition with empty detector chamber. No sample or container must be placed on the detector.
This procedure is performed at station installation or on specific request.
The procedure is reported in APPENDIX E: Background procedure .

3.6. SOURCE CERTIFICATE FILES

Source certificate files are located in `\ctbto\home\config`, they contain the source specifications and are appended at the end of spectrum data.
Calibration and Quality Check sources should be replaced when the activity of radionuclides becomes too low. In case of replacement, a new certificate file must be compiled according to the assay provided with the new source. For details on how to compile the new certificate file refers to APPENDIX I: New certificate file creation.

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4. RMS SOFTWARE

4.1. INTRODUCTION

The main software components installed on the station computer are:

- RMS (station management software)
- ORTEC Gamma Vision (Detector data acquisition and analysis software)
- Utilities (barcode generator, CD writer, Antivirus, etc.)

The main function of the RMS software is to acquire data from the various station devices, display to operator and transmit them to the National and International data centres.
Data, warnings and alarms are displayed to the station operator through the Operator Interface. A copy of all sent data is kept on the hard disk for a period of two months.
The RMS computer acquires:

- spectra from the detector
- state of health data from the data logger, the UPS, the air sampler, the bar code readers
- meteo data from the local meteo station

Acquired data are sent periodically to the data centres through e-mail. The RMS computer time is UTC, synchronised by a GPS clock.
The RMS software commands are protected by security access levels based on the Windows NT logon.
Gamma Vision software is used mainly for detector calibration as described in the calibration procedure.

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4.2. DIRECTORY STRUCTURE

The RMS directory structure is represented in figure 9. In this structure reside all data produced by the RMS software, the software executables and source codes.

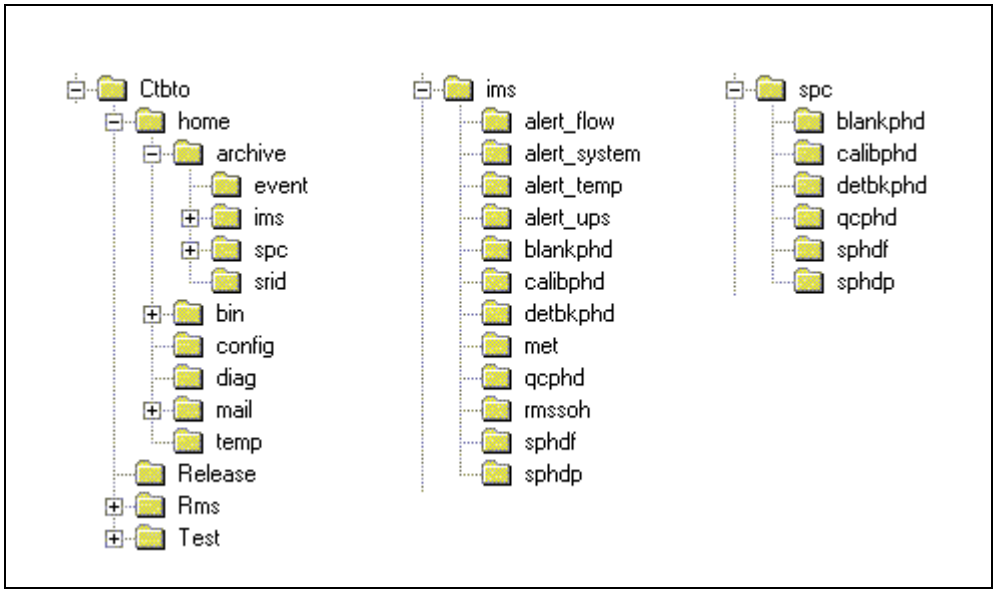

Figure 9. RMS software directory structure

All data produced on a periodical base are kept for two months, then deleted. The event log files and non periodical data (e.g. Calibration spectra) are not deleted.
Here is a list of most important folders:

Folder	Content
\ctbto\rms	source code
\ctbto\home\bin	Executables
\ctbto\home\config	RMS configuration files
\ctbto\home\archive	root folder where data are stored

The archive subfolders:

Folder	Content
\event	event log files (one for each month)
\ims	nuclear and state of health data in IMS format organised in subfolders. All the messages sent to IDC in Vienna are stored here.
\spc	nuclear data in Gamma Vision spc format organised in subfolders
\srid	log files for the filter ID's passed under collection

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The ims subfolders:

Folder	Content
\alert_flow	Flow rate alert messages
\alert_system	General system alert messages
\alert_temp	Crystal overtemperature alert messages
\alert_ups	Power supply alert messages
\blankphd	All the blank filter spectra acquired at the station
\calibphd	All the calibration spectra acquired at the station
\detbkphd	All the background spectra acquired at the station
\met	Meteorological data
\qcphd	QC spectra
\rmssoh	State of health data
\sphdf	Full sample spectra
\sphdp	Partial sample spectra

4.3. RMS SERVICE

The RMS Application is started at boot-up runs as a system service (background). The system administrator can start and stop the RMS Application by double clicking the Service icon in the Control Panel window (task bar: Start / Settings / Control Panel) and selecting the Radionuclide Monitoring System service:

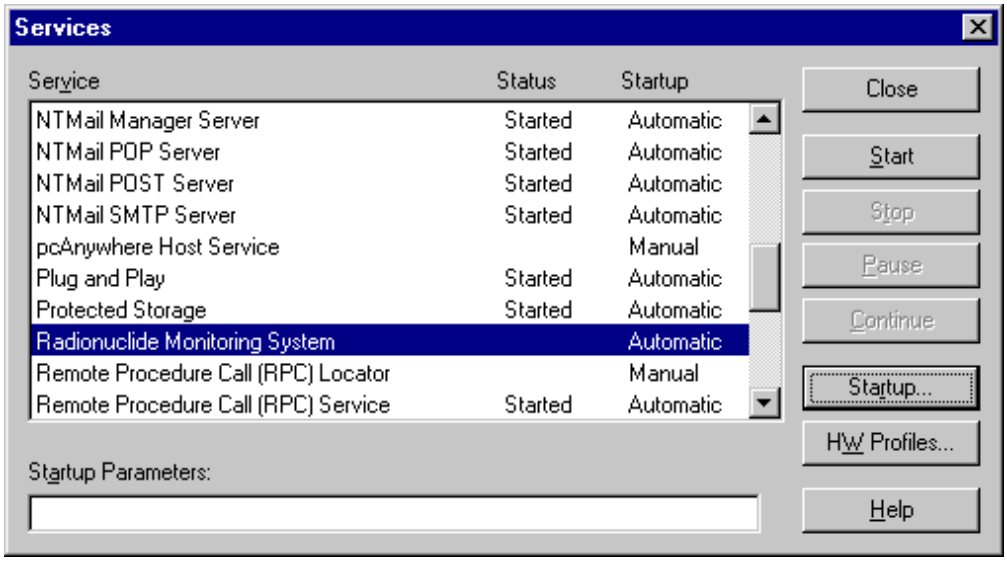

Figure 10. Manually starting the service

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The Startup column must be set to Automatic in order to start the RMS application at boot time. The Startup window configuration for the Radionuclide Monitoring System service is:

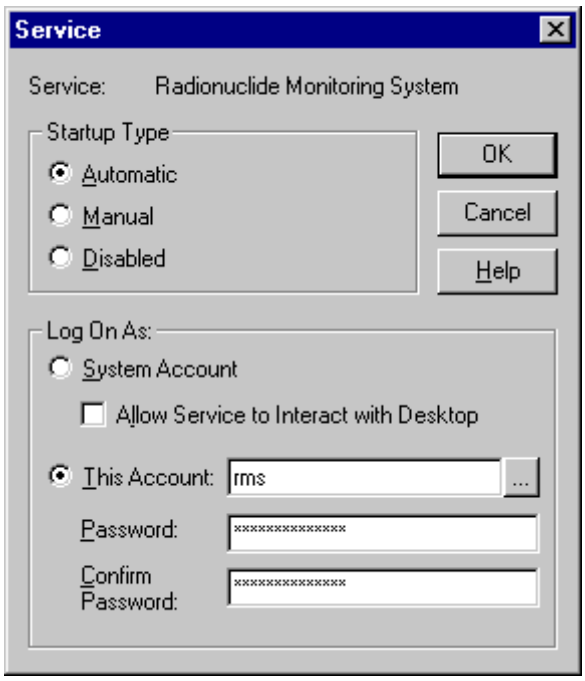

Figure 11. Service settings

WARNING! The Administrator should stop the RMS service before shutting down the system. This assures that spectra and state of health data are sent to IDC before shutdown. The automatic shutdown due to power failure stops the RMS service before the system power off.

4.4. OPERATOR INTERFACE

The interface between the RMS Application and the Operator is called Operator Interface. It is a Man-Machine Interface (MMI) that starts automatically on system start-up, showing a summary of the system status related data, without any possibility to interact with it. The user can also start the Operator Interface by double clicking the RMS Operator icon on the desktop. Figure 12 shows the screen of the operator interface. The screen can be divided into 6 elements:

- The main area
- The Environment Status area
- The Events Log window
- The Commands area
- The icon bar
- The status bar

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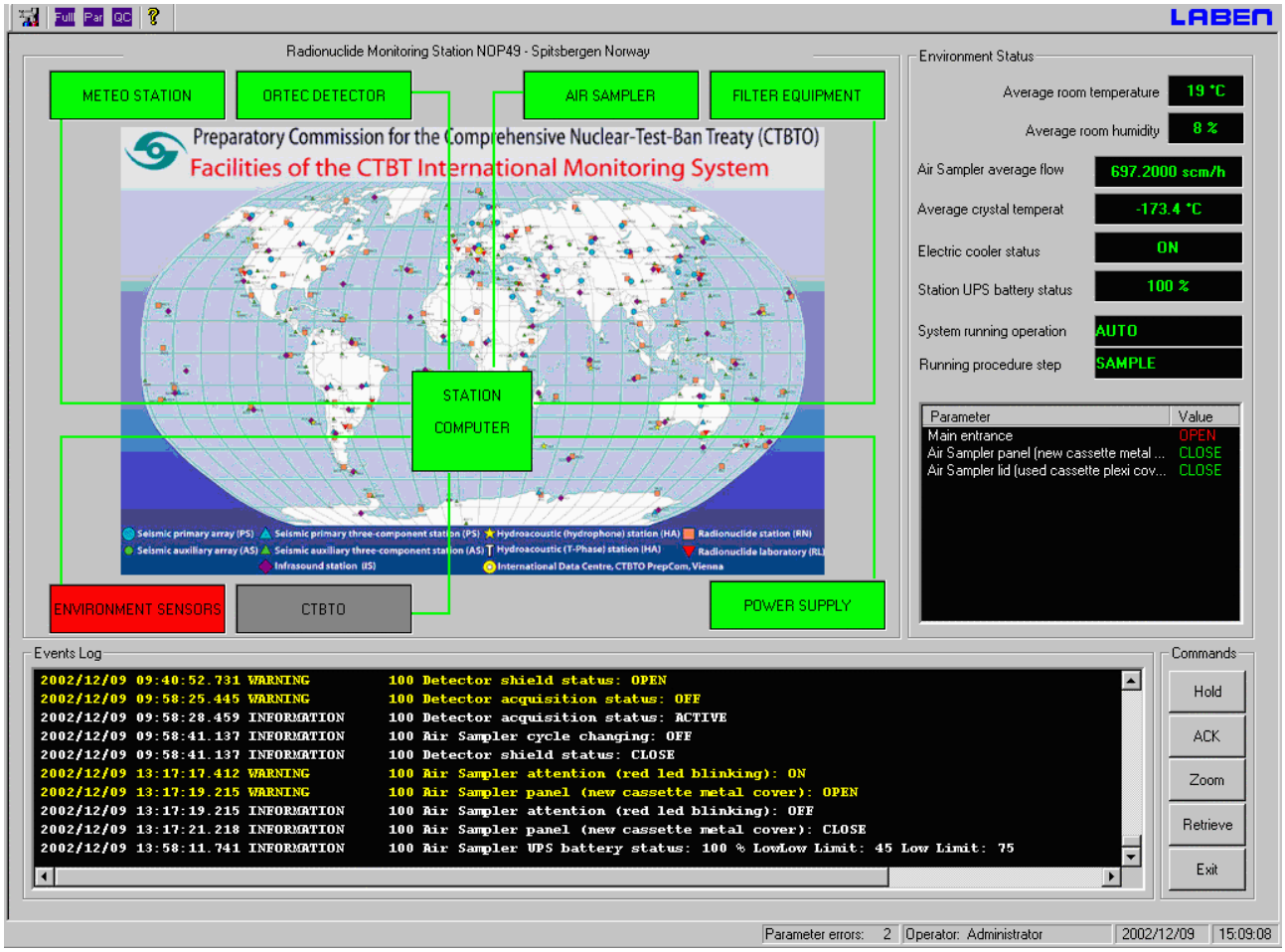
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Radionuclide Monitoring Station NOP49 - Spitsbergen Norway
METEO STATION
ORTEC DETECTOR
AIR SAMPLER
FILTER EQUIPMENT
Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty (CTBTO)
Facilities of the CTBT International Monitoring System
STATION COMPUTER
ENVIRONMENT SENSORS
CTBTO
POWER SUPPLY
Environment Status
Average room temperature 19 °C
Average room humidity 8 %
Air Sampler average flow 697.2000 scm/h
Average crystal temperat -173.4 °C
Electric cooler status ON
Station UPS battery status 100 %
System running operation AUTO
Running procedure step SAMPLE
Parameter Value
Main entrance OPEN
Air Sampler panel (new cassette metal ... CLOSE
Air Sampler lid (used cassette plexi cov... CLOSE
Events Log
2002/12/09 09:40:52.731 WARNING 100 Detector shield status: OPEN
2002/12/09 09:58:25.445 WARNING 100 Detector acquisition status: OFF
2002/12/09 09:58:28.459 INFORMATION 100 Detector acquisition status: ACTIVE
2002/12/09 09:58:41.137 INFORMATION 100 Air Sampler cycle changing: OFF
2002/12/09 09:58:41.137 INFORMATION 100 Detector shield status: CLOSE
2002/12/09 13:17:17.412 WARNING 100 Air Sampler attention (red led blinking): ON
2002/12/09 13:17:19.215 WARNING 100 Air Sampler panel (new cassette metal cover): OPEN
2002/12/09 13:17:19.215 INFORMATION 100 Air Sampler attention (red led blinking): OFF
2002/12/09 13:17:21.218 INFORMATION 100 Air Sampler panel (new cassette metal cover): CLOSE
2002/12/09 13:58:11.741 INFORMATION 100 Air Sampler UPS battery status: 100 % LowLow Limit: 45 Low Limit: 75
Commands
Hold
ACK
Zoom
Retrieve
Exit
Parameter errors: 2
Operator: Administrator
2002/12/09
15:09:08

Figure 12. Operator interface screen.

The currently logged operator's privileges define the available functions.
There are three different access levels, each having its own WINDOWS NT™ user group, which are “Observer”, “Operator” and “Manager. In this way it is possible to have several user accounts with the same access level.
The users are entirely defined in Operator and Manager groups, the Observer group is intended only for the automatic logon at system startup.
A set of privileges have been defined in the RMS system and allocated to the user groups as reported below:

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User group	Privileges
Observer	Can only look at the operator interface No desktop or system access
Operator	Access the applications Acknowledge the alarms Send command to equipment Perform procedures as background, blank filter, calibration Access the archive
Manager	All mentioned above and: Full access to operating system Start/Stop RMS application Remote logon Online change the parameter limits Change the station configuration as certificate updating etc.

Table 3. User group rights

The RMS OPERATOR process displays on the screen the following data:

- station parameters from air sampler, nuclear measurement system, environmental sensors
- state of the health of the various devices
- last system events occurred

System events are logged on the eventlog file stored in the …`\archive\event` directory; when the operator requires the displaying of old events already archived, data are retrieved from that file.

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Main area

The main area (figure 13) shows a synoptic diagram with the main system blocks: station computer, meteo station, detector, airsampler, filter equipment (barcode readers), environment sensors, CTBTO, power supply.

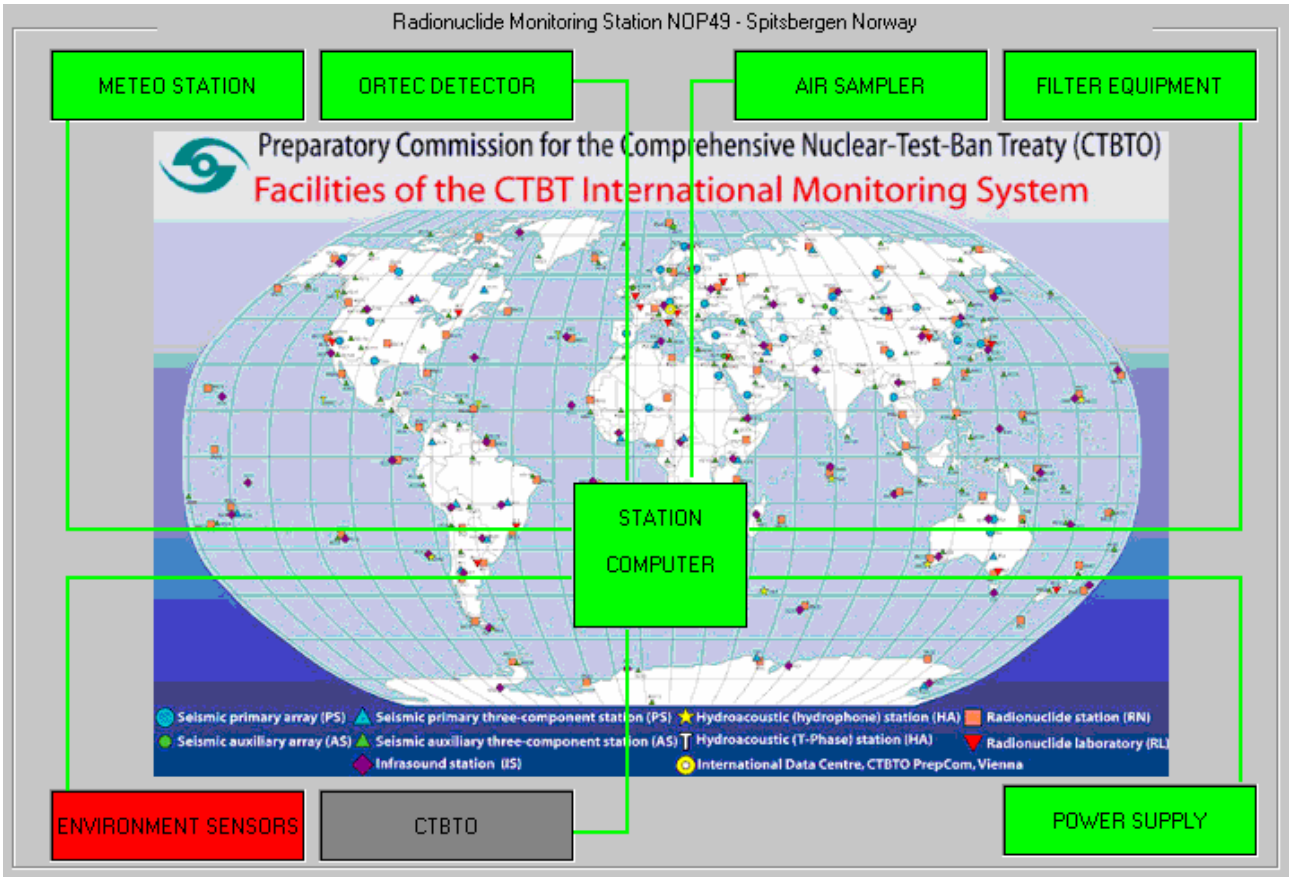

Figure 13. The Main area.

Each block has a colour that informs the user about its status (see the previous colour/status table). The connection links between the station computer and the external blocks also have a colour to inform about the health of the link.
Operators can access detailed system information by clicking on the desired block.

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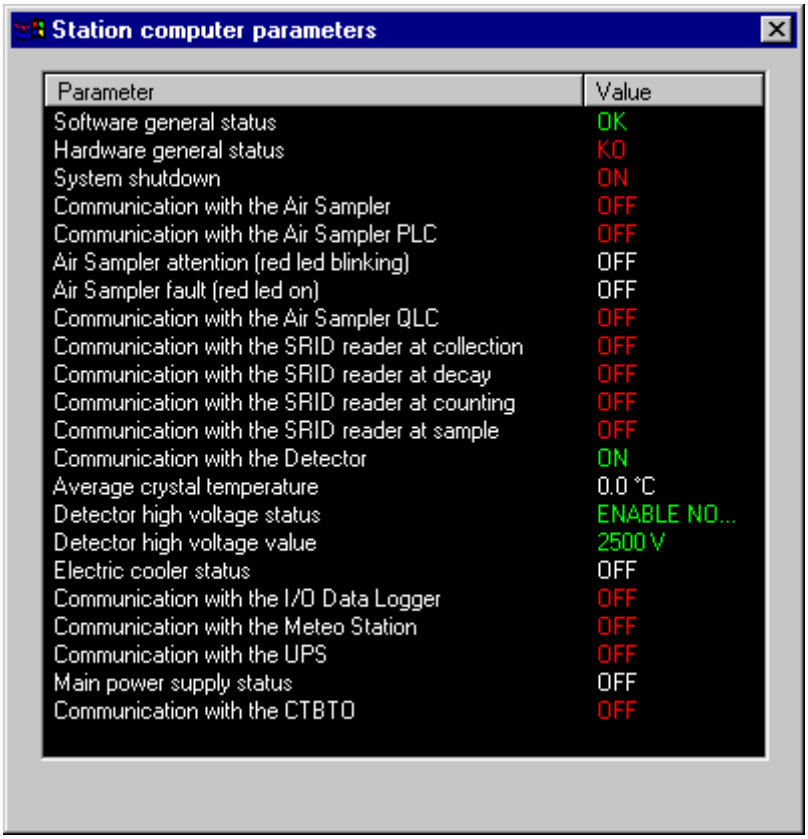

Figure 14. Station Computer window (hardware and software status parameters).

In the Station Computer window, a summary of the most important system parameters is presented. The parameters listed here are taken from the other windows of the operator interface except:

- Software general status: this indicates that all the software sub-processes are running properly.
- Hardware general status: this is an OR of all the hardware related alarms.
- System shutdown: it indicates if a shutdown procedure has been initiated

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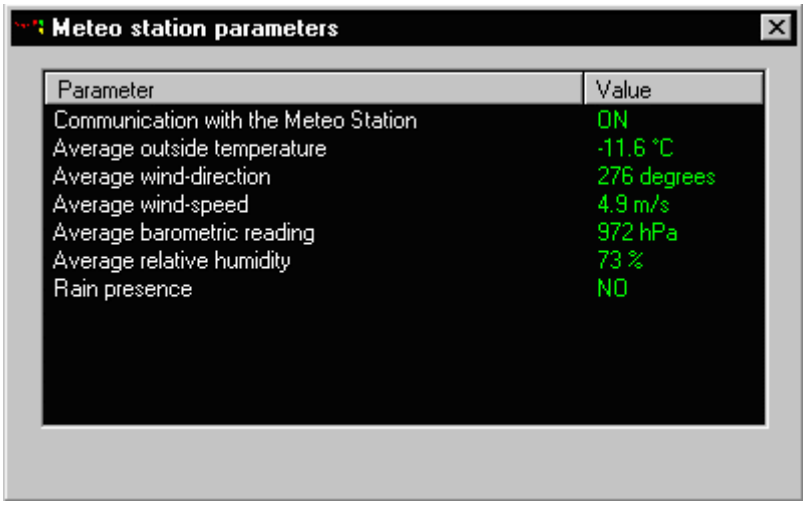

Figure 15. Meteo Station window.

The Meteo station window displays the status of serial link with meteorological data acquisition unit and the parameters from the external meteorological sensors:

- Outside temperature and humidity
- Average wind direction and speed
- Atmospheric pressure
- Presence of precipitation

In normal conditions the parameter values are displayed in green. In case of sensor fault or disconnection, the parameter is shown in white indicating that the data is not available.

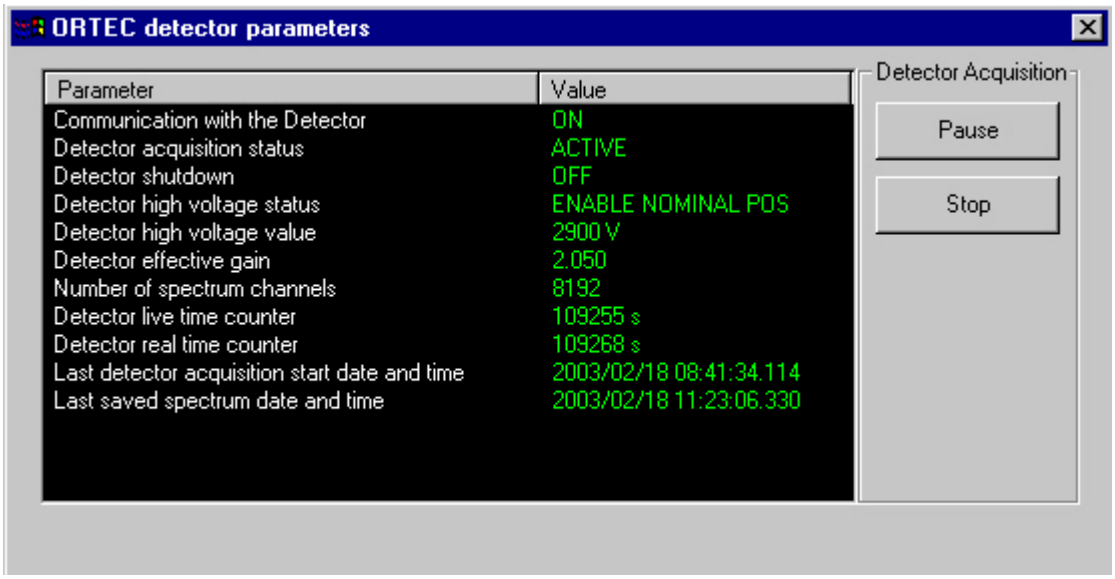

Figure 16. ORTEC Detector window.

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The ORTEC DETECTOR block window shows the detector state of health and acquisition parameters:

- Communication link with detector
- Acquisition status (Active/Off)
- High Voltage value, polarity and status (enable, disable, overload)
- shutdown status (shutdown occurs in case of current overload or crystal overtemperature)
- Amplifier gain
- Acquisition data: start, live and real times

The acquisition can be paused or stopped manually by clicking the buttons on the right of the window:
Pause: pauses the acquisition and sends a partial spectrum to IDC, then the acquisition can be resumed by pressing “Resume” button. The acquired spectrum is not cleared.
Stop: stops the acquisition and sends a full spectrum to IDC. This command is used to terminate the acquisition manually before the daily filter change. A new spectrum can be started from scratch by pressing the Start button.
Resume or start buttons appear only when the acquisition has been Paused or Stopped.
Detector control is disabled if the user does not have the required access right (Station Manager or Station Operator) or if the communication with the detector is OFF (due to detector power OFF or LAN troubles).

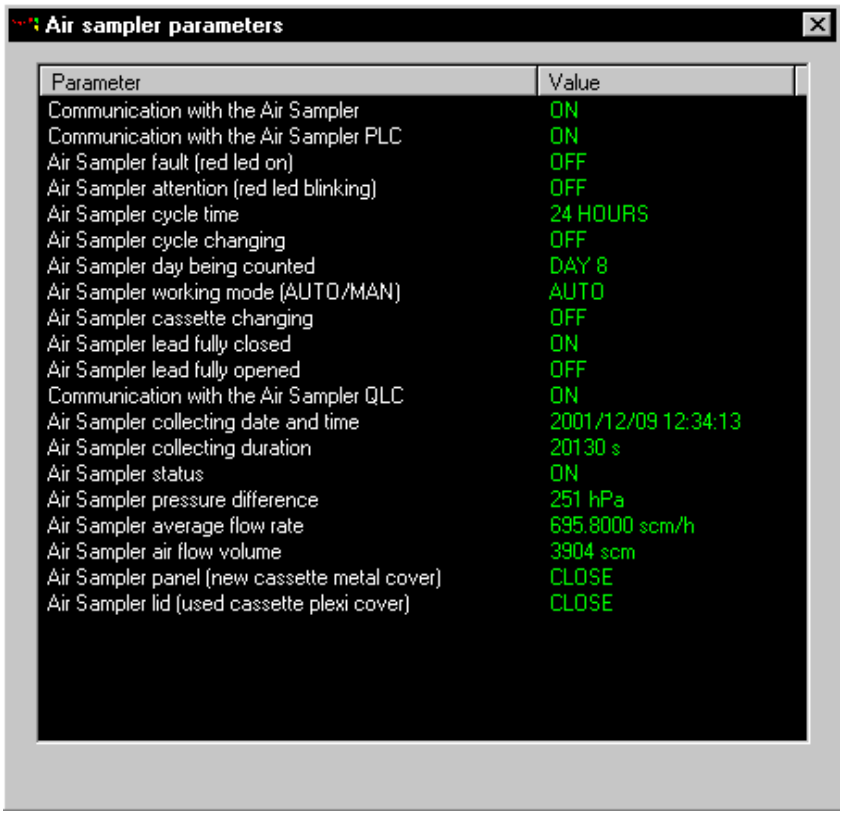

Figure 17. Air Sampler window.

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The Air Sampler window displays air sampler state of health, tampering alarms, and air flow parameters:

- Collection start time
- Collection elapsed time
- Pressure difference over the flow meter orifice
- Flow rate (STP corrected)
- Total air flow volume in m^3

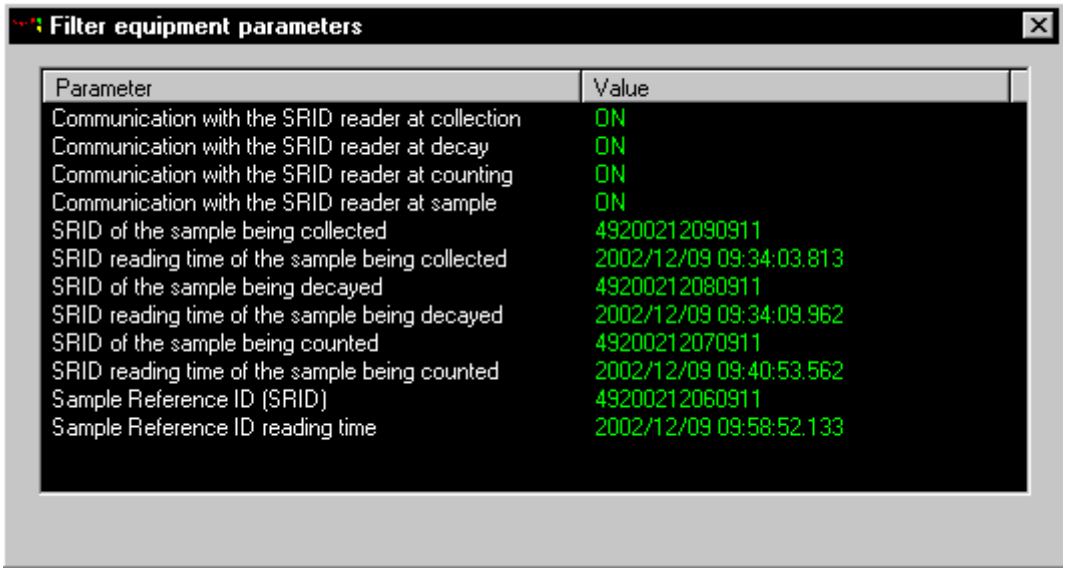

Figure 18. Filter Equipment window (bar code readers parameters)

This window displays the information about bar code readers: link status and last code read with time and date of last readout.

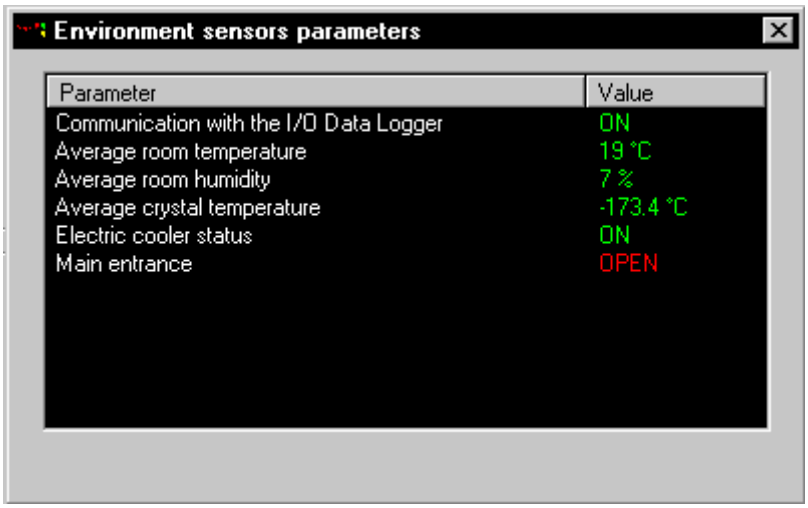

Figure 19. Environment Sensors window (I/O data logger OPTO22 parameters).

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This window gives information about:

- Datalogger to PC ethernet link status
- Room temperature and humidity
- Detector crystal temperature
- Cryogenic cooler status
- Station entrance door status

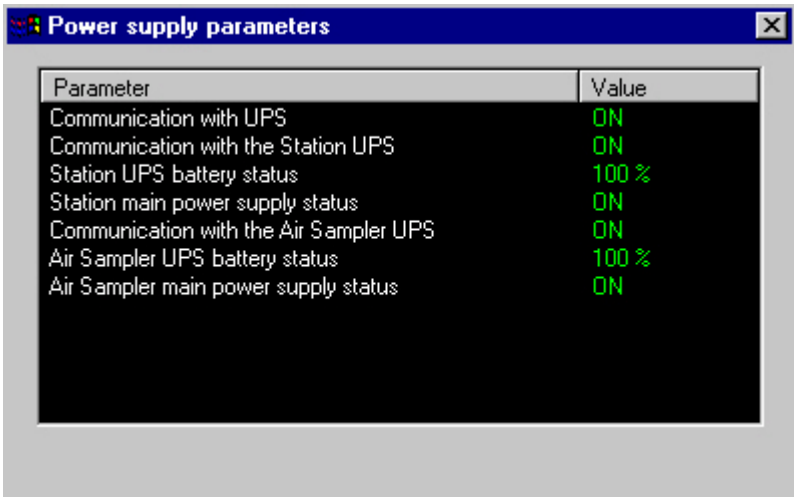

Figure 20. Power Supply (UPS parameters).

Link status and residual charge data for both the UPS units (station and airsampler) are displayed in the UPS window.

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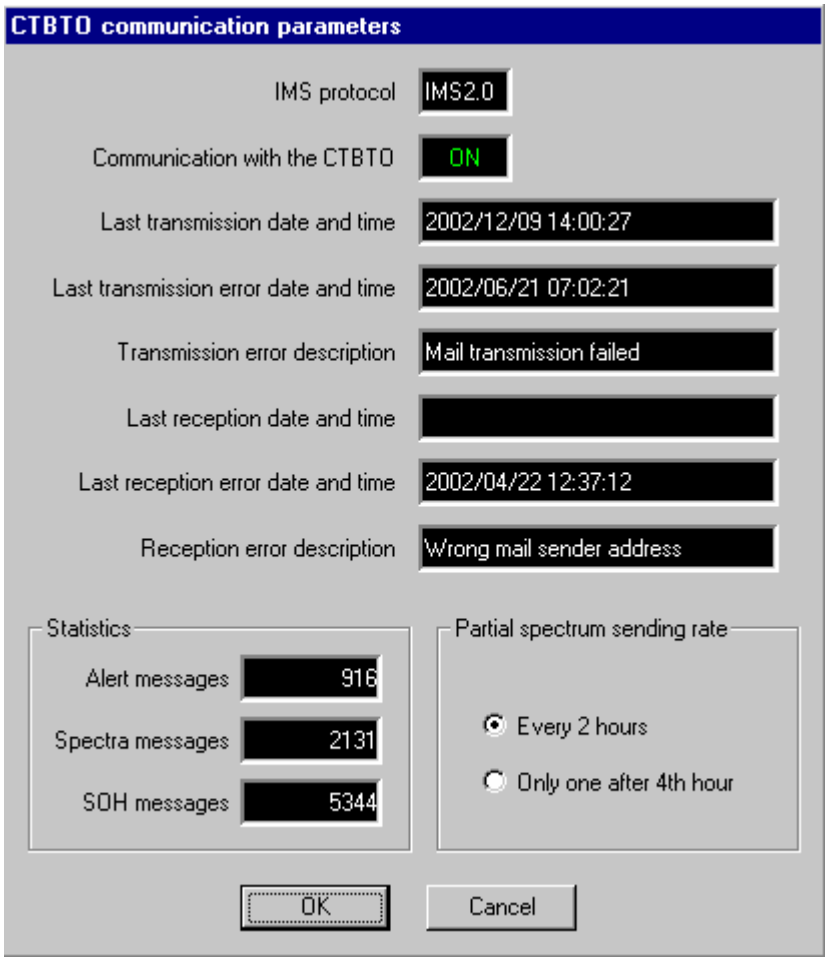

Figure 21. CTBTO Communication window.

The CTBTO block differs from the other windows. It holds some statistical and transmission/reception data. The user can also select the partial spectrum sending rate (every 2 hours or only one after the 4th hour). Only privilege users (station manager) can select the CTBTO block to change the partial spectrum sending rate.

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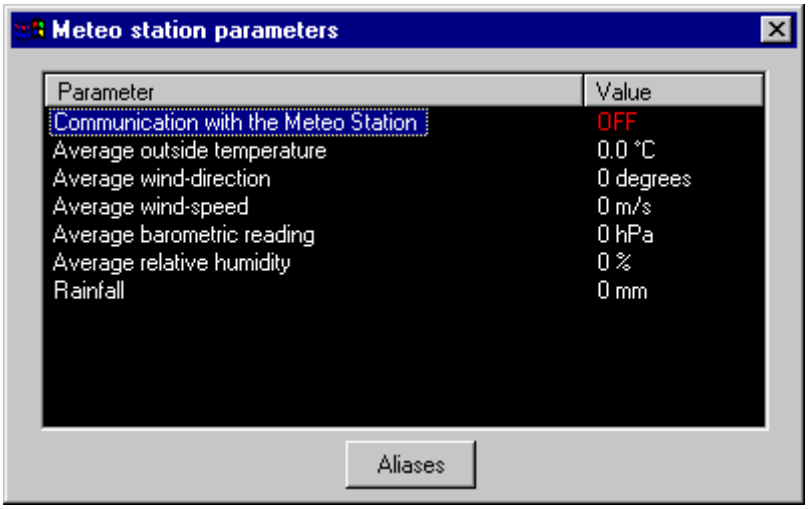
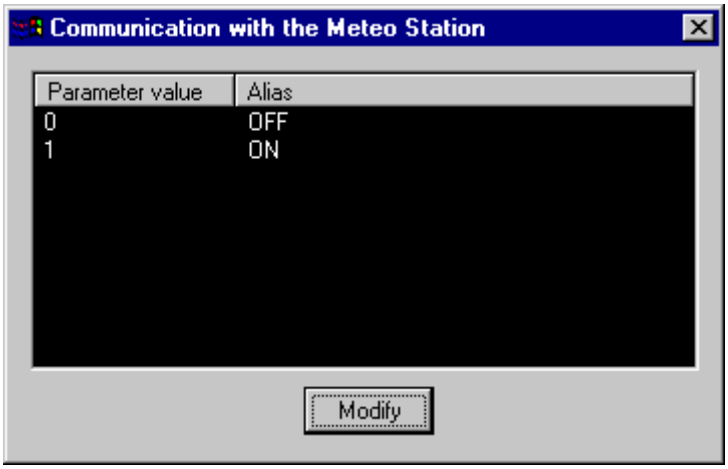
4.4.1. Parameter limits

The RMS users can select a parameter in a block window to look at the parameters aliases (digital parameters) or limits (analog parameters):



By clicking on the Aliases button which appears when selecting a digital parameter (e.g. Communication with the Meteo Station), the user can look at the parameter aliases (text related to the digital parameter value):



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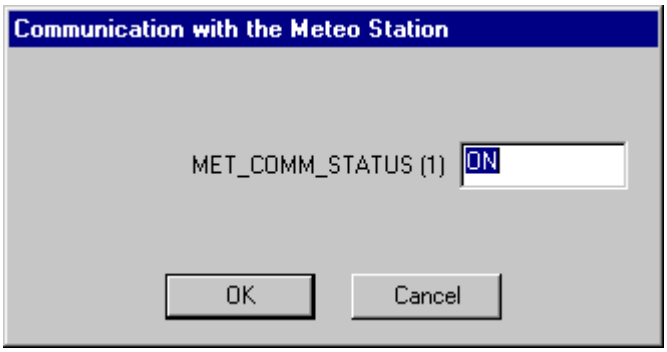
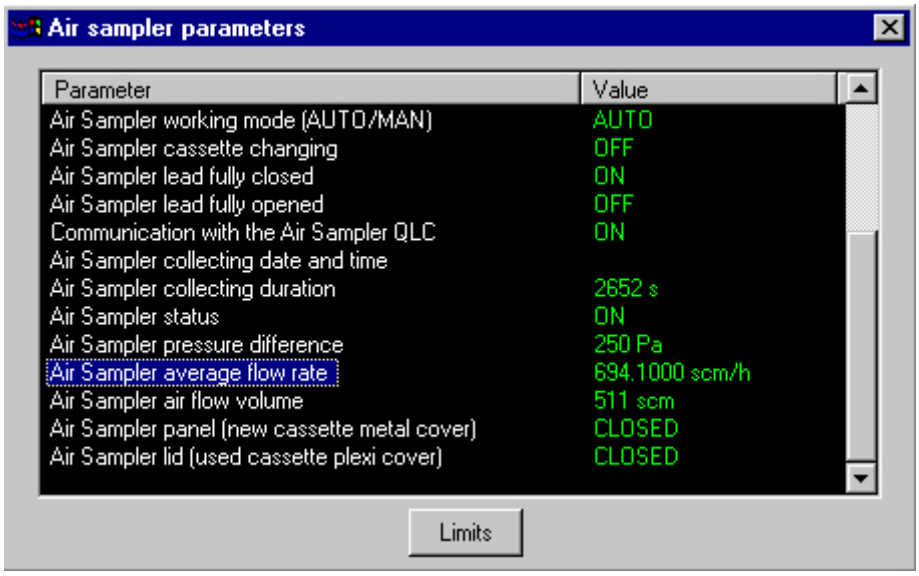
The privileged users (Station Manager) can select a parameter value to modify the related alias:



By clicking on the Limits button which appears when selecting an analog parameter (e.g. average outside temperature), the user can look at the digital parameter limits (value related to the analog parameter value):



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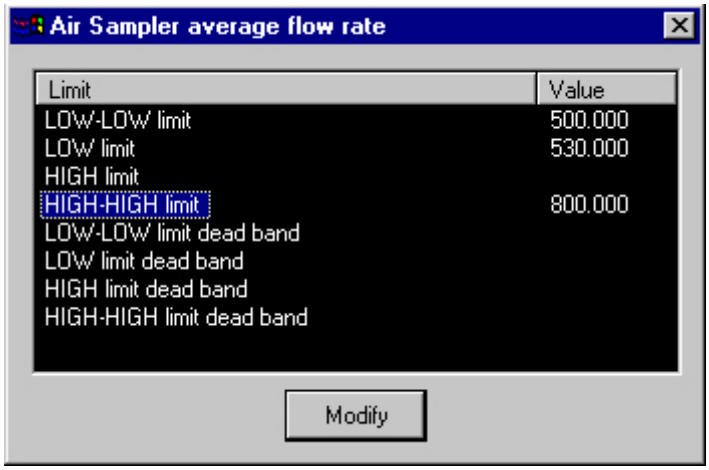
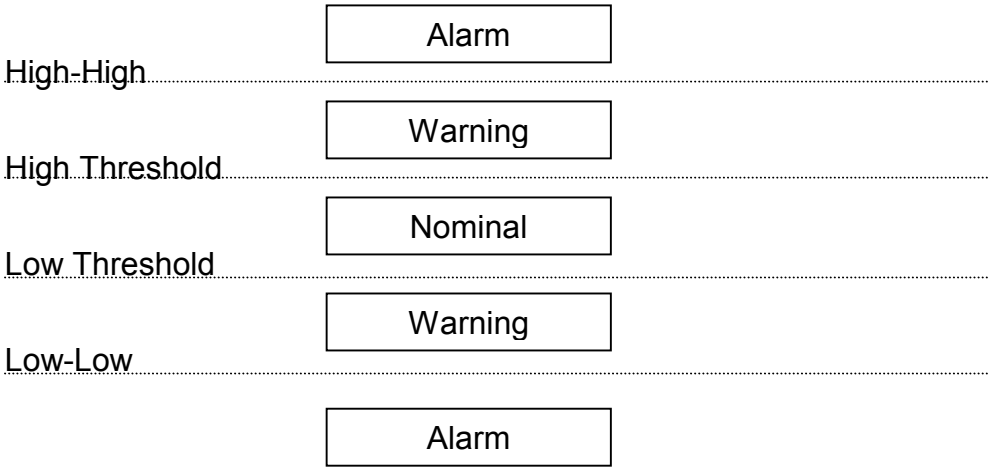
The privileged users (Station Manager) can select a parameter limit to modify the related value:



There are 4 limits (low-low, low, high, high-high), each with its own dead band. The low and high limits are warning thresholds. The low-low and high-high limits are alarm thresholds.



By enabling a limit, the RMS Application automatically gets a warning (yellow) or alarm (red) event when the parameter value crosses a limit.

The dead band is useful when an oscillation is foreseen for a measure: to avoid bursts of event/alert action each time a threshold is crossed, a dead band is specified. This feature permits the event/alert action only when the value goes down to the upper value threshold minus the dead band value. Once reached this condition the parameter status can go again in nominal condition. A figure can represent the situation.

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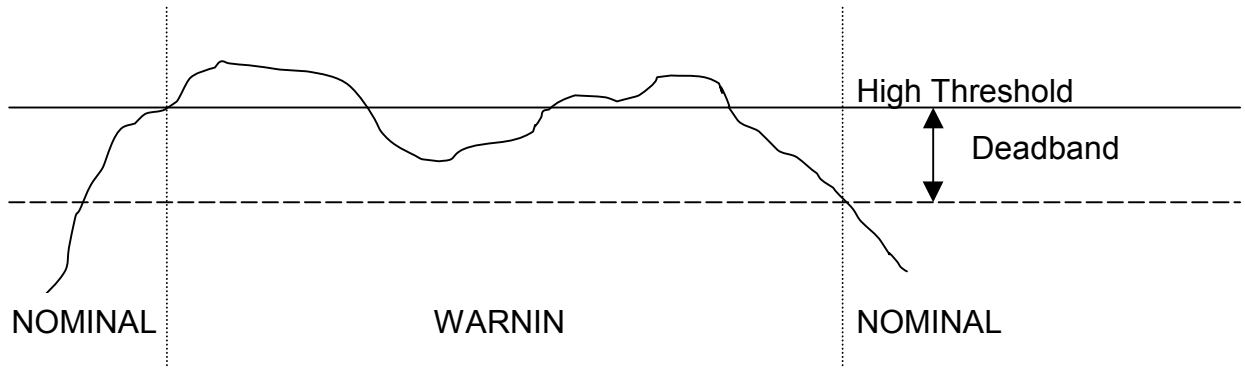
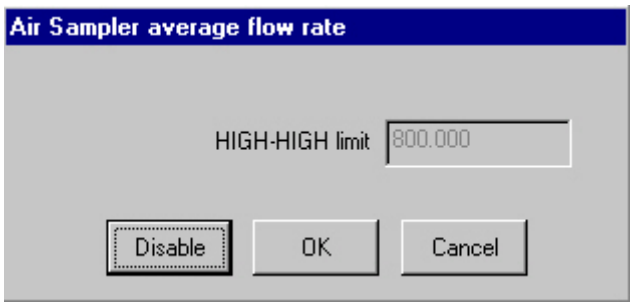


The dead band value must be added to the low-low and low limits and must be subtracted to the high and high-high limits.
The user can modify and enable a limit or dead band value in the related window.



Before modifying a limit or dead band value, the user has to disable the limit or dead band, otherwise the value field is not enabled.

WARNING! All the modified aliases, limits or dead bands should be added to the parameter file. A new installation (or station parameters database rebuilding) will overwrite the modified values with the default (initialisation) values. To edit parameter files use a text editor. These files are stored in `d:\ctbto\home\config\`.The analog parameters are stored in `paramana.txt` while digital are in `paramdig.txt`.

Environment Status area.
The Environment Status area holds a summary of most critical station parameters. Such parameters appear also in the other blocks of MMI, along with the other parameters of the same kinds. That means that each block presents a set of parameters, a sub-set appears also in the Environment Status Area.
Such parameters may be listed as follows:

- Room temperature and humidity from the inside sensor
- Airsampler flow in m^3/h
- Detector crystal temperature

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- Electric cooler status: ON means the cooler is regularly powered, OFF means that the cooler compressor is off and the detector temperature is increasing.
- UPS battery status: is the level of charge (in percent) remaining in the station UPS (the one powering the instrument rack). Note that while the battery is charging after a power failure, the value does not rise gradually to 100%, instead it jumps to 100% only at charge completed.
- System running operation: it displays which operation the system is currently performing. The possible values are explained in table 4.

Message	**Description**
NONE	The system is in unknown state (e.g. at power on with airsampler in manual mode)
SAMPLE	The detector is acquiring the 24h spectrum and the airsampler is sampling
CYCLE ON	The daily cycle (cassette change, filter cut, beaker manipulation) is in progress
QC	Quality check spectrum acquisition running...
CALIBRATION	A calibration procedure is running (maintenance)
BLANK	A blank filter procedure is running (maintenance)
BACKGROUND	A background procedure is running (maintenance)

Table 4. List of system running operation

- Tamper sensors list: this area shows the status of a variable list of tampering sensor (according to the configuration of the radionuclide station).

The values of all the parameters in the black fields have a colour depending on the parameter status:

Colour	**Status**
White	Unknown
Green	Normal
Yellow	Warning
Red	Alarm

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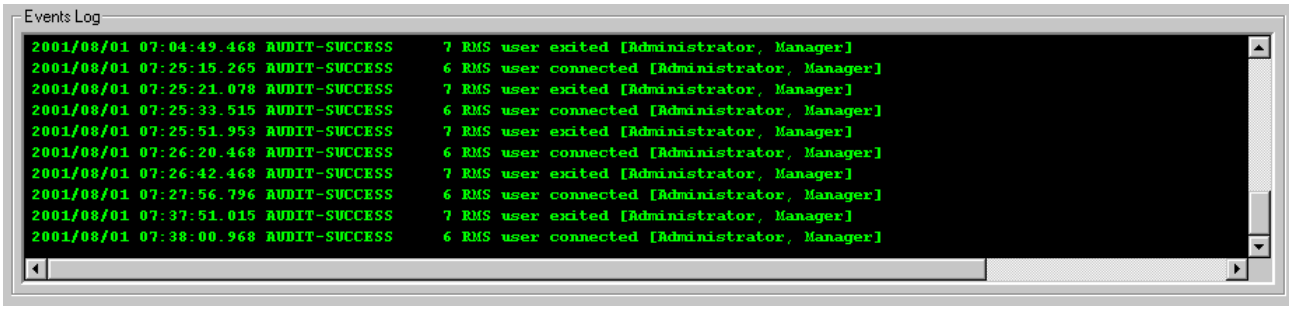
Events Log window

The Events Log window shows the last 100 RMS events ordered by date and time:


Events Log
2001/08/01 07:04:49.468 AUDIT-SUCCESS 7 RMS user exited [Administrator, Manager]
2001/08/01 07:25:15.265 AUDIT-SUCCESS 6 RMS user connected [Administrator, Manager]
2001/08/01 07:25:21.078 AUDIT-SUCCESS 7 RMS user exited [Administrator, Manager]
2001/08/01 07:25:33.515 AUDIT-SUCCESS 6 RMS user connected [Administrator, Manager]
2001/08/01 07:25:51.953 AUDIT-SUCCESS 7 RMS user exited [Administrator, Manager]
2001/08/01 07:26:20.468 AUDIT-SUCCESS 6 RMS user connected [Administrator, Manager]
2001/08/01 07:26:42.468 AUDIT-SUCCESS 7 RMS user exited [Administrator, Manager]
2001/08/01 07:27:56.796 AUDIT-SUCCESS 6 RMS user connected [Administrator, Manager]
2001/08/01 07:37:51.015 AUDIT-SUCCESS 7 RMS user exited [Administrator, Manager]
2001/08/01 07:38:00.968 AUDIT-SUCCESS 6 RMS user connected [Administrator, Manager]

The first field is the date of the event, then its time, type, description identifier (ID) and the full description of the event (more information).

There are five types of RMS events. Every event type has an associated colour:

TYPE	Colour
AUDIT-FAILURE	Red
AUDIT-SUCCESS	Green
ERROR	Red
INFORMATION	White
WARNING	Yellow

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The event description identifiers are:

ID	DESCRIPTION
1	Radionuclide Monitoring System started
2	Radionuclide Monitoring System stopped
3	Login succeeded
4	Login failed
5	Logout
6	RMS user connected
7	RMS user exited
8	RMS user action
9	RMS user comment
10	Network Login succeeded
11	Network Login failed
12	Network Logout
21	Filter code [SRID] not found
22	The filter code [SRID] didn't change
23	The filter code [SRID] didn't match the expected value
24	The filter code [SRID] changed unexpectedly
98	Shutdown procedure enabled
99	Shutdown in progress
100	(no description, free text)

Usually the event description ID and the event type are linked, e. g. all events with ID 4 are AUDIT-FAILURE (red) events, but this is not a rule: in fact ID 100 is a free text event used to signal the alarm, warning and nominal condition of the station parameters (temperatures, tampers, etc.); it can be an information (normal condition, white), a warning (yellow) or an error (alarm, red).
The logged events are stored in a monthly event log file:

`e:\Ctbto\home\archive\event\yyyymm.txt`

i.e. `200205.txt` for may-2002 event log.
Table 5 contains an example of the data that are available in the computer log file.

```
Date       hour          Event id       event CODE           INFO

2003/01/08 13:57:49.033 AUDIT-SUCCESS     6 RMS user connected [Administrator, Manager]
2003/01/08 13:57:52.708 ERROR           100 Communication with the Air Sampler QLC: OFF
2003/01/08 13:58:16.342 WARNING         100 Air Sampler attention (red led blinking): ON
2003/01/08 13:58:16.342 INFORMATION     100 Air Sampler cassette changing: OFF
2003/01/08 13:58:16.342 INFORMATION     100 Air Sampler cycle changing: OFF
2003/01/08 13:58:16.342 INFORMATION     100 Air Sampler fault (red led on): OFF
2003/01/08 13:58:16.342 WARNING         100 Air Sampler working mode (AUTO/MAN): MANUAL
2003/01/08 13:58:16.342 INFORMATION     100 Communication with the Air Sampler PLC: ON
2003/01/08 13:58:16.342 INFORMATION     100 Detector shield status: CLOSED
```

Table 5. Computer log file example.

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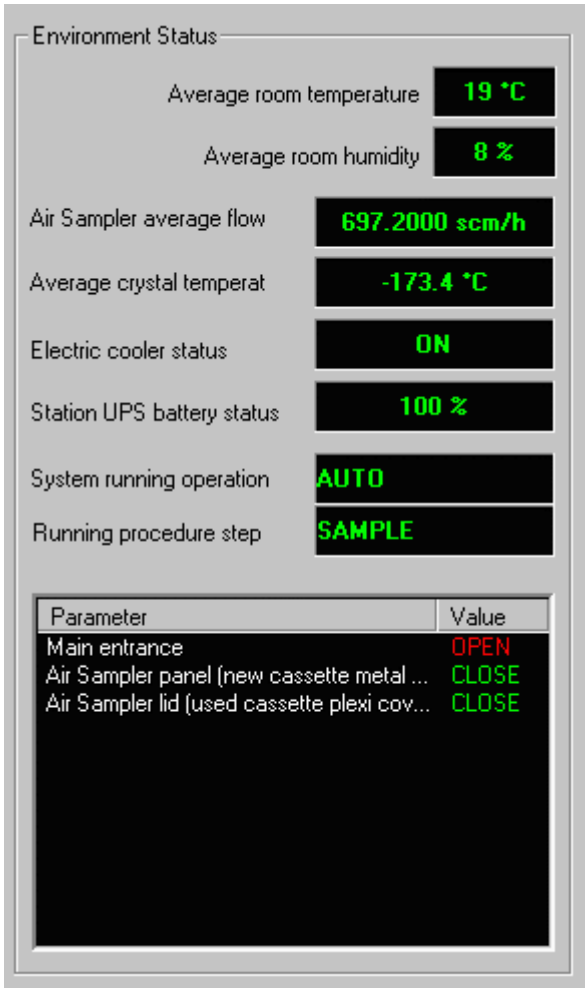
The right part of the RMS OPERATOR window shows the Environment Status area.



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Commands area

The Commands area holds the buttons related to the Events Log window and the Exit button:

Hold	Stop the Events Log window scrolling when a new events arrives.
ACK	Acknowledge the selected event. The event turns its colour to cyan (light blue) and it is archived.
Zoom	Open a bigger and sizeable Events Log window with its own Hold and ACK buttons.
Retrieve	Open a text window with all the archived events of the month requested by the user.
Exit	Exits from the RMS Operator interface. For Observer and Operator groups it also causes logout from the NT session.

The icon bar

The icon bar in the main window opens the maintenance window and the last full, partial and QC spectrum plot window:

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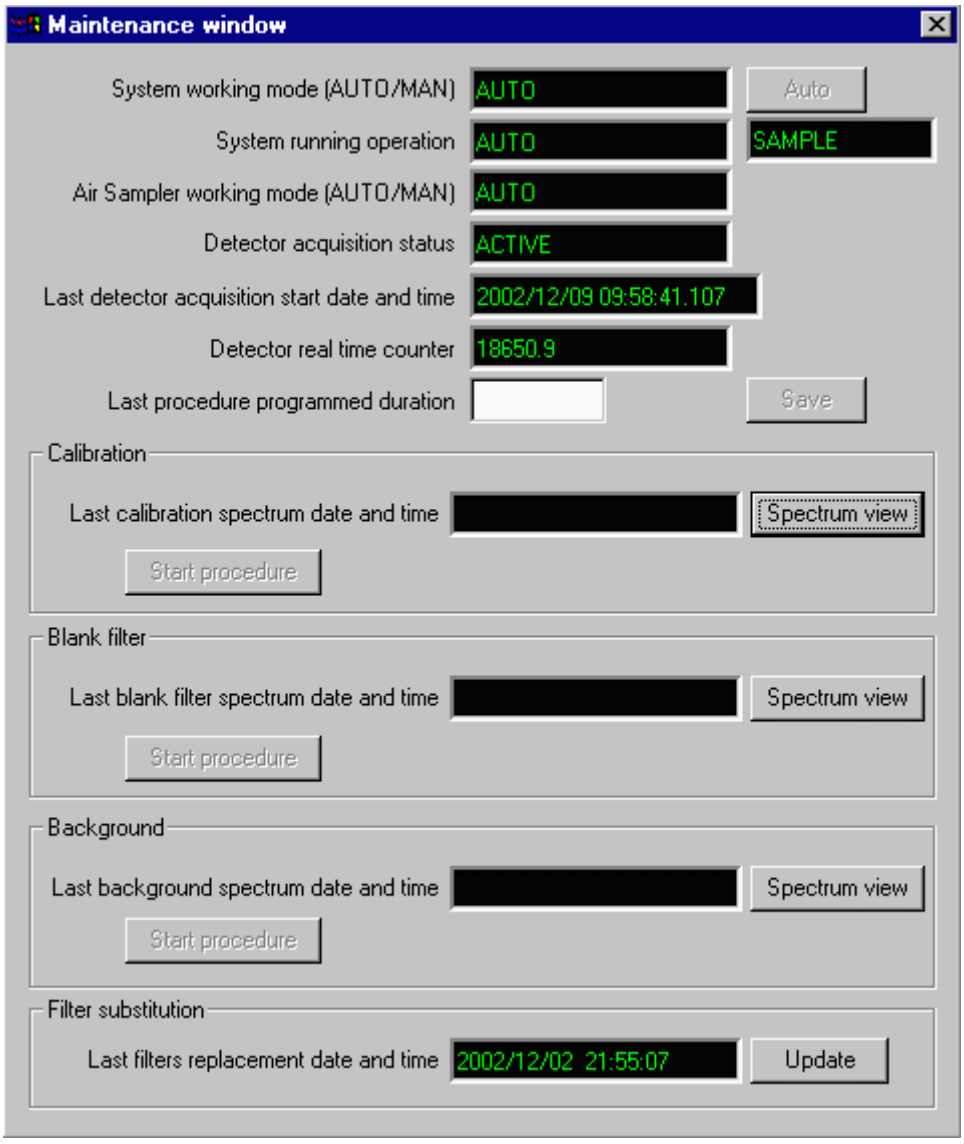
4.5. MAINTENANCE WINDOW

The maintenance window is accessed through the relative button on the icon bar.



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The window shows the current system and air sampler working mode (AUTO/MANUAL). The System running operation displays the current step of operation according to table 4. Acquisition data are also echoed in the maintenance window for convenience. The “Last procedure programmed duration” input box is used to enter the duration of the procedure before starting it with the relative button.
In the bottom half of the window there is one box for each procedure (Calibration, Blank filter, Background spectrum). The procedures can be started and stopped and the last acquired spectra can be displayed. Refer to the single procedures reported in appendixes for detailed information.
The filter replacement date and time should be updated when substituting the air sampler filters (every 14 days).

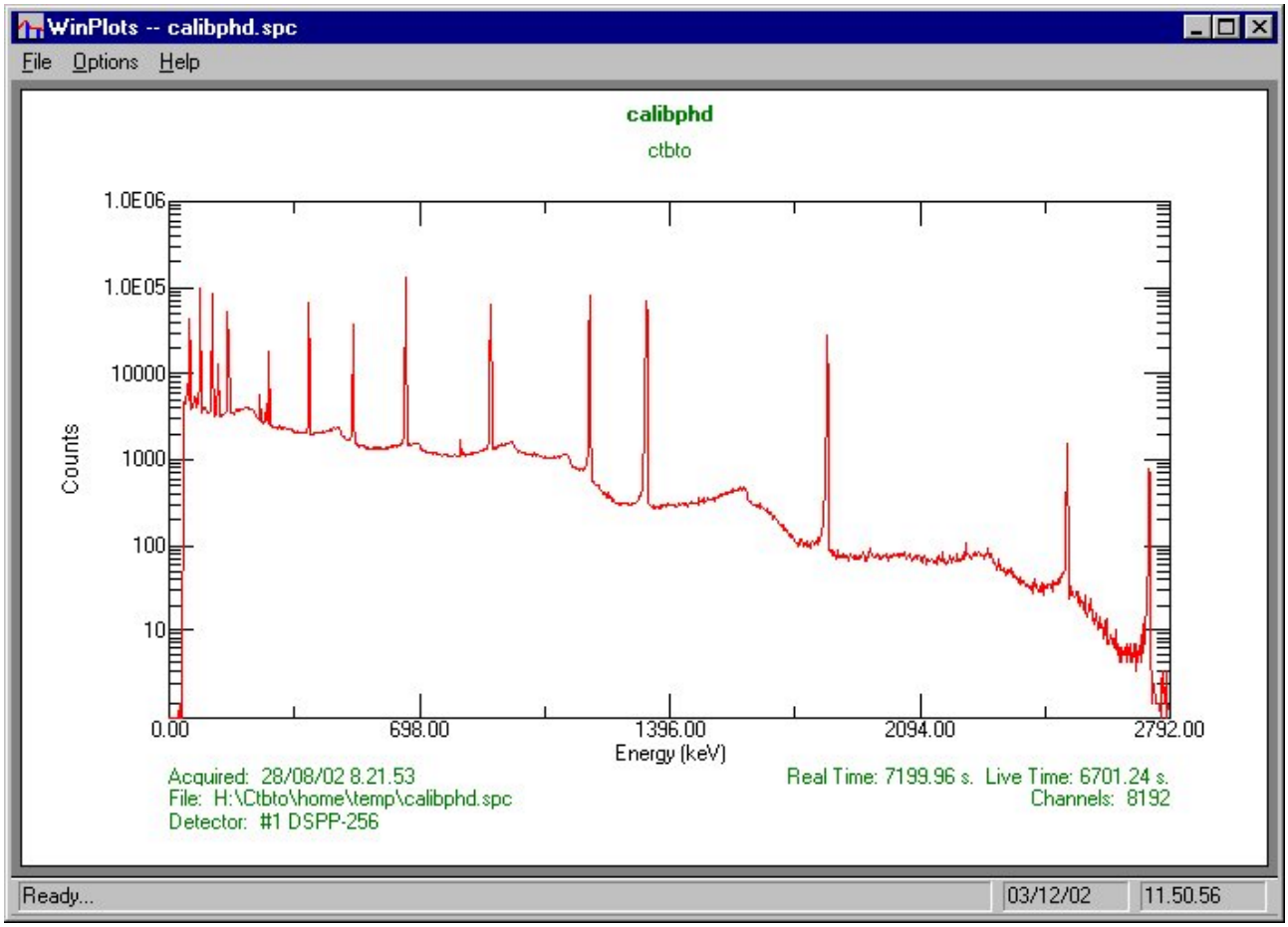

Figure 22. Calibration spectrum view.

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4.6. DATA BACKUP

The backup of all data in the “archive” folder should be done periodically (every 15 or 30 days according to CTBTO specifications). The station PC is provided with a CD recorder. Incremental backups are done on CD-R 650MB. For the first backup insert a new CD, next ones will be made on the same multisession CD until it is full.
Refer to APPENDIX F: Periodic data backup for the procedure.

4.7. SYSTEM RECOVERY

In case of serious Hard Disk failure, the system disk partitions (c and d) may be damaged. In this case the system may hang during start-up or become very unstable. The hard disk substitution is then required. In order to move the operating system and all the applications to the new disk a backup CD set is required. The backup CD set should be done each time modifications are made to the software resident in c or d or PC configuration.
For more information see procedures in APPENDIX G: System backup and recovery.

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5. PERIODIC MAINTENANCE

5.1. INTRODUCTION

Periodic maintenance consists of pre-defined activities to check station SOH and replace parts that are out of order or at the and of their planned operating life, if any.
One day per year shall be reserved for periodic maintenance. During such a day the station shall not be operating.
The table in the next section defines the maintenance activities.

5.2. RACK EQUIPMENTS

Items	Description
UPS	Uninterrupted Power Supply State of health: to test the correct working condition, shut down the station main power switch and check that the station can be supported by the UPS and the power failure alert is correctly reported on the event log. Then restore the main power and check the correct information in the event log. UPS BATTERY SHOULD BE SUBSTITUTED EVERY 5 YEARS.
PC	Clean the dust protection filter in the front panel of the PC. It can be easily removed by opening the drive panel door. Execute ScanDisk on c, d and e drives.
GPS clock	The GPS led on the left of the unit should be green blinking. From the station PC ping the IP address written on the unit to check network connection.
LAN cables	From the back of the rack, check that the LAN cables are connected firmly.
Tampering sensor	Check the functionality of the door tamper sensor

5.3. AIRSAMPLER

For the airsampler and pump unit maintenance operations please refer to the Cinderella documentation.

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5.4. METEO STATION

Since the external meteorological sensors can be exposed to extremely hard environmental conditions, it is of major importance to ensure the proper maintenance to this part of the Radionuclide Station.
During station maintenance campaigns, inspect the external meteo sensors and support pole. The pole must be rigidly fixed and free of any sign of corrosion at junctions.

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6. TROUBLESHOOTING

6.1. DETECTOR

Error	Possible Cause	Instructions
High Voltage Shutdown	Detector crystal has warmed up	Check crystal temperature on the operator interface. Check the Cryosecure (cooler power control unit) status LED's. Check that the cooler compressor is working.
Cooler does not work	Power control unit (cryosecure) has cut the power to the cooler because of crystal warming. Fuse blown up.	Wait for the 48h cycle Check fuses on Cooler and on UPS cooler output
FWHM is too high, Peaks are shifted	The detector has warmed up, improper setting of MCA, Electronic noise, magnetic disturbances, ground loop, poor grounding.	Restore operative conditions re-calibrate the detector improve configuration, remove noise sources re-calibrate the detector
High Voltage Overload	HV output shorted Detector damaged	Ortec service needed

Table 6. Detector troubleshooting

NOTE: For further detector troubleshooting items, please, refer to the ORTEC detector documentation.

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6.2. AIRSAMPLER

Air sampler troubleshooting is a delicate issue since any manual intervention on the machine can interfere with the automatic sampling sequence causing the loss of the daily spectrum.

Never put the air sampler in manual mode during the filter change or QC acquisition unless a major fault happens.

When a fault happens during the filter change cycle follow this procedure:

1. Open the detector window and stop the gamma acquisition.
2. Fix the problem following table 7 and/or the Air Sampler user manual.
3. Perform a short reset and put the air sampler in automatic mode.
4. From the detector window, start the acquisition: a new spectrum acquisition will begin.

Below is a description of Cinderella display messages:

DISPLAY	MEANING	CAUSE	SOLUTION
X-OVERCURRENT	Robot X-axis gone to over current.	Obstacle in x-axis movements	Clear obstacle. Push short RESET.
Y-OVERCURRENT	Robot X-axis gone to over current.	Obstacle in x-axis movements	Clear obstacle. Push short RESET.
INVERTER ERROR	Normally pump/inverter over current	Dirty filter Change filter.	Push short RESET.
Z-OVERCURRENT	Robot X-axis gone to over current.	Obstacle in x-axis movements	Clear obstacle. Push short RESET.
LIFT PUMP	Small vacuum pump overcurrent.	Failure to lift cup. Protection blown out.	Push BUTTON 1F10 and 1F20 inside the air sampler electronic box.
CASETTE ERROR	In Cutting Position cassette was not found.	Cassette reflective label not detected.	Check the cassette reflective label.
NEW CASETTE ERROR	New Cassette Storage cassette wrong way or mirror label missing.		
* Refer to the layout of Cinderella control box interior in the air sampler manual			

Table 7. Cinderella fault messages description

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DISPLAY	MEANING	SOLUTION
AUTOMATIC	Automated mode	
MANUAL	Manual mode	
LEAD OPENING	Lead shield opening	
LEAD CLOSING	Lead shield closing	
LEAD OPEN	Lead shield open	
NEW CASETTE WAREHOUSE EMPTY	No new cassettes.	Fill with new cassettes
USED CASETTE WAREHOUSE FULL	Too many used cassettes.	Take away cassettes
NEW CASETTE COVER OPEN		Close cover
USED CASETTE COVER OPEN		Close cover
RESET	Short RESET.	Signs all errors
LONG RESET	Long RESET.	Resets everything to first day situation.
PLEXIUM SHIELD OPEN	Inverter stopped	
INVERTER STOP	Inverter stopped	
EMERCENCY STOP	Emergency Button is pushed IN	

Table 8. Cinderella warning messages description

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APPENDIX A: FILTER CASSETTE LOADING/UNLOADING

The operator has to carry out the following procedures:

1. Check for any error on the airsampler display
2. Exit the Observer screen and log in as Operator
3. Check on the Operator Interface the state of health of the various subsystems
4. Print 14 new barcodes
5. Unload the analysed samples and store them at the station
6. Open used cassette cover
7. Remove used cassettes
8. Clean the cassettes from old filter residues
9. Refill the 14 cassettes with new filters and stick the labels
10. Load the cassettes in the new filter cassette tray
11. In the maintenance window, update the “last cassette change” date
12. Exit the Operator Interface

In the following pages pictures illustrate the basic operations.

Opening and removing the used cassettes.

Before filter changing operation, the airsampler looks like figure 23.
All these steps have to be done carefully and by taking care of the machine mechanics.

Figure 23. The machine appearance when the operation of changing the filters has to be performed.

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1. Loosen the screw that blocks the used cassette cover.
2. Shift the used cassette cover from the right side position to the left side:

Figure 24.

3. The used filter cassettes tray is now visible:

Figure 25.

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4. Take out the used filter cassettes by hands:

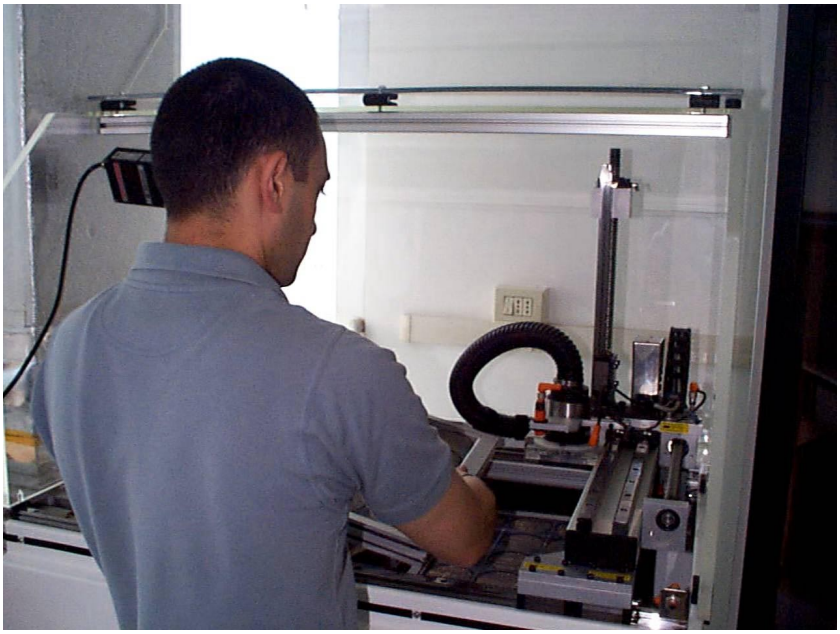

Figure 26.

5. The used filter cassette rack is empty:

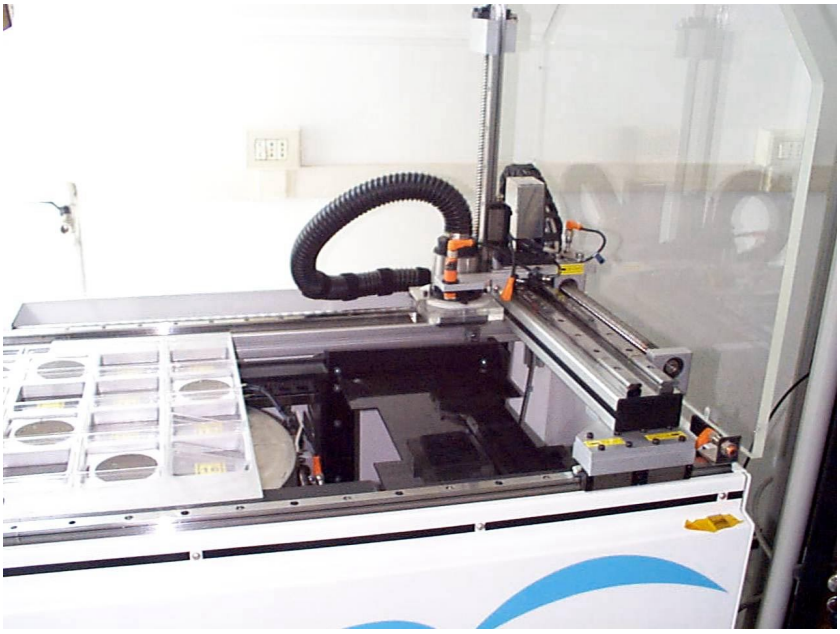

Figure 27.

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6. Restore the used filter box plate into the right position in order to restore the original machine configuration:

Figure 28.

7. Tighten the screw that blocks the used cassette cover.

Preparation of new filters

If the paper for the filter is stored into rolls, the first thing that has to be done is to cut the paper to the frame dimension. After that the filter paper got the right dimension it is possible to put it inside the filter frame. To do this it is necessary to open with a screwdriver the frame. After that the frame has been opened, the filter can be put inside the frame. At this point it's necessary to close the frame and fix it using its screws.
The following pictures, from to 31 are explaining the procedure.

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Figure 29. The operator is opening the filter cassette.

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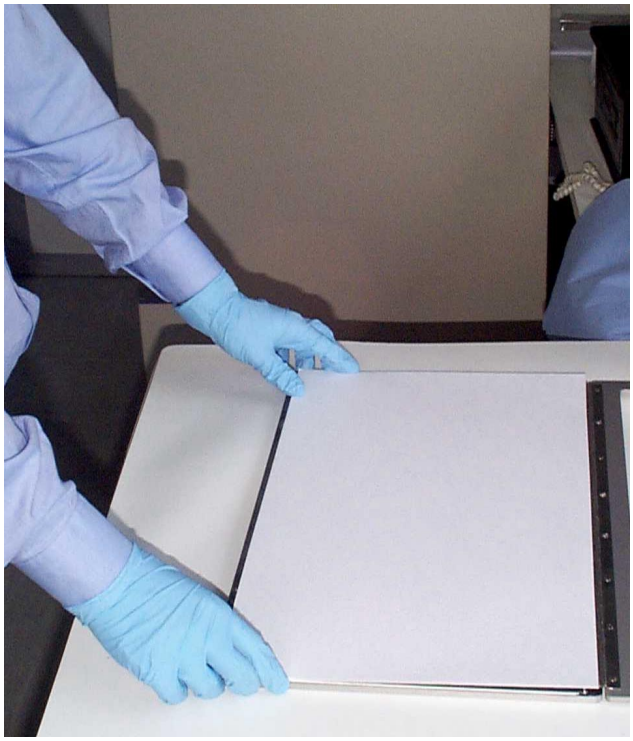

Figure 30. The operator is putting new filter in the cassette

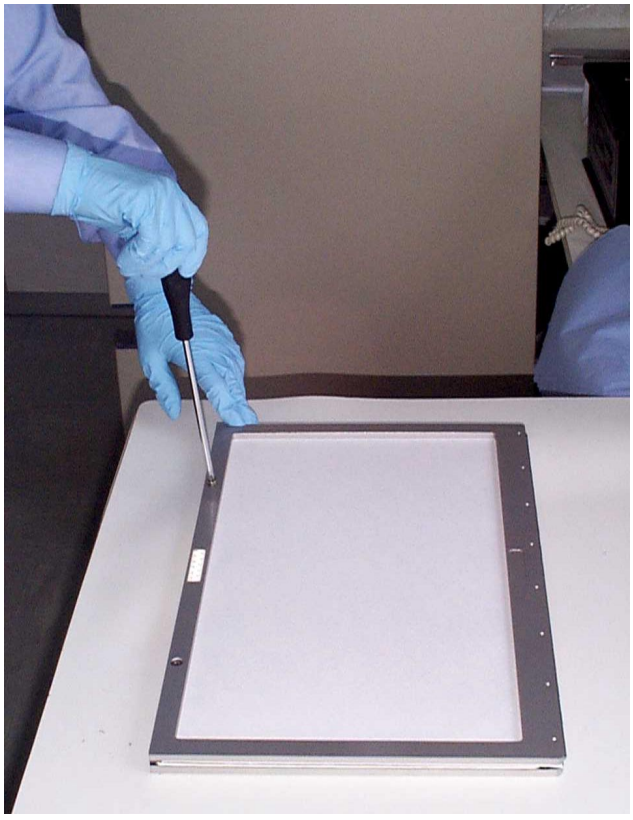

Figure 31. The operator is closing the filter frame

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Labelling the filters

The filter identifier consists of 14 digits according to the IMS standard:

`NNyyyymmddhhXX`

where:

`NN`	is the RN station number,
`yyyy mm dd hh`	represent the date and time (year, month, day and hour) when the filter will go under the airflow
`XX`	is always 11 (refer to IMS format documentation for more details)

Filters should be labelled using 50x23mm stickers placed in the top left corner of the filter as indicated in figure 31.

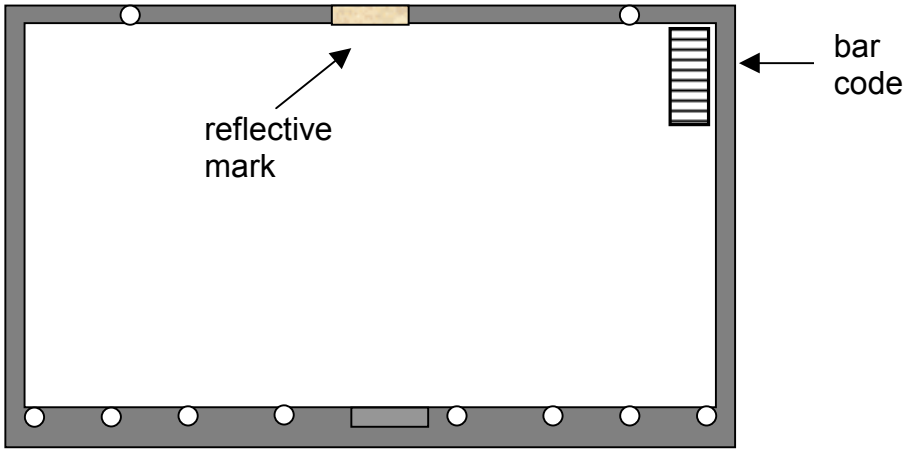

Figure 31. Correct barcode placement.

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APPENDIX B: REDUCED DECAY TIME

There are three possible procedures for reduced decay period:

1. For a reduced decay period of 6 hours press F1 on airsampler panel. The 6h indication appears on the display.

2. If a decay period different from 6h is requested, the filter cycles can be forced by the operator. In this case the operator takes care of the timing of the filter change. With the system in automatic mode at the right time, press F5: the system will perform a cassette change, filter cut and sample manipulation and a QC spectrum. Take care that the normal changing time set in the airsampler doesn't interfere with the manual operations.

3. Alternatively it is possible to reset the airsampler changing time after each cassette change i.e.: for a decay time of 3h set to 8:00 then to 11:00 then 14:00 …

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APPENDIX C: CALIBRATION PROCEDURE

1. Set Cinderella in Manual Mode (push F1 in the Cinderella command display panel. The led “manual” must flash).
2. Turn off the pump (F3).
3. Open the lead shield (F2).
4. Open the plexi cover
5. Remove the sample from the detector.
6. Put the calibration source in a beaker and on the detector
7. Close the plexi cover.
8. Close the lead shield (F2).
9. From the Operator Interface open the “Maintenance window” by clicking the first icon on the top-left of the main windows.
10. Set the acquisition time writing (for example 02:10) in the field “last procedure programmed time”.
11. Select the “Start procedure” in the Calibration section

    Check the dead time of the detector. It should be no greater than 10%-15%.

    Note : during the spectra acquisition you can check the spectra increasing by opening Gamma Vision. A base parameter is the FWHM of the CO60 Nuclide, which value must be less than 2.5. To display that value, go on that peak with the cursor, and click with the right button of the mouse. A window with “peak info” will appair.

    … After programmed time the system will stop the acquisition of the spectrum
12. Open the lead shield (F2) and take out the source.
13. Replace the souce in the storage cabinet
14. Open Gamma Vision (you will find the acquired spectrum)
15. Select *Acquire* / *Copy to buffer*
16. Go to the buffer display (select “Buffer” from the droplist on GammaVision toolbar)

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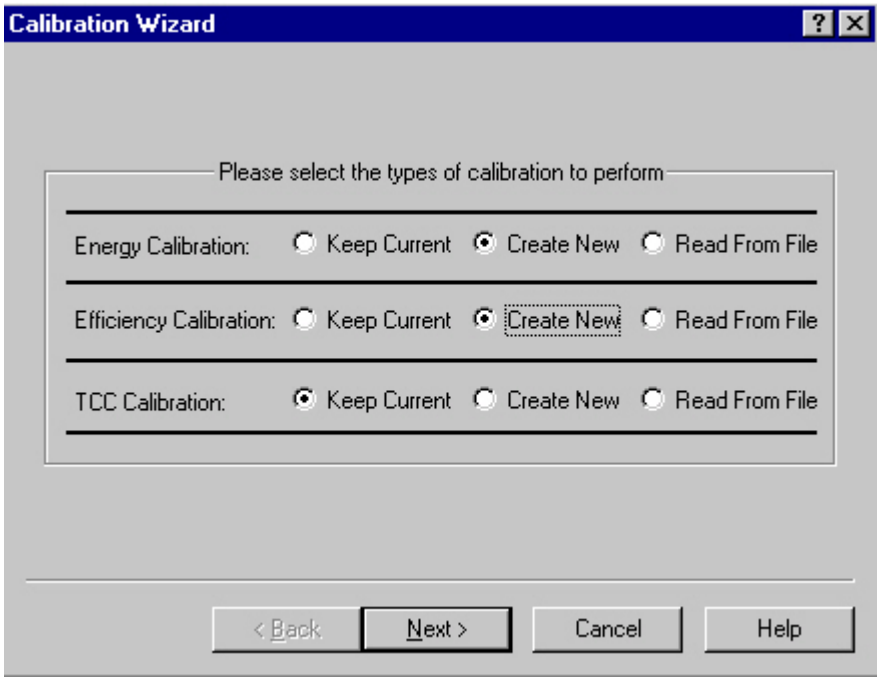
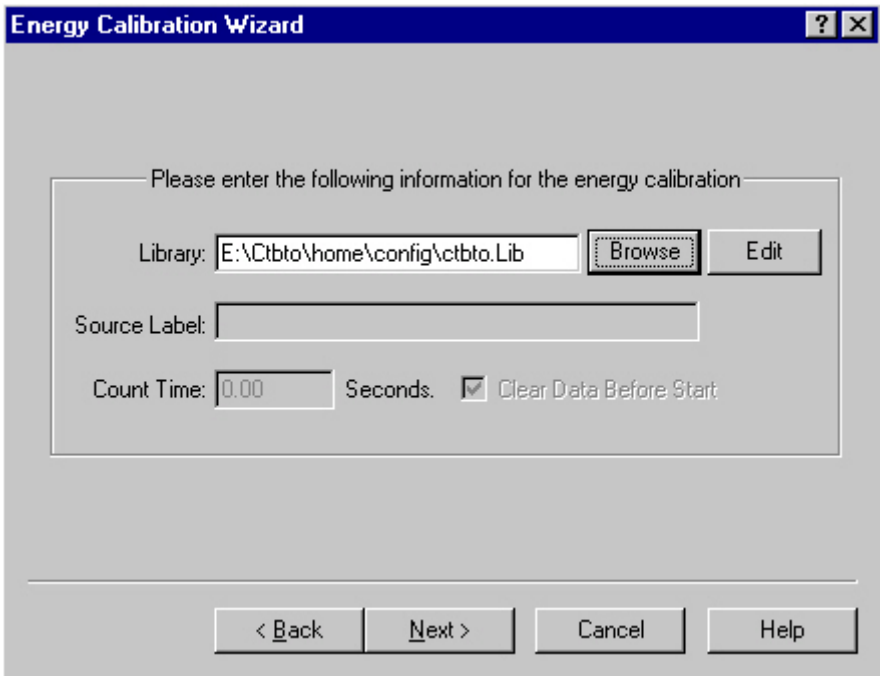
Calibration Wizard:

17. Select Calibrate/Calibration Wizard ...


Calibration Wizard
Please select the types of calibration to perform
Energy Calibration: Keep Current Create New Read From File
Efficiency Calibration: Keep Current Create New Read From File
TCC Calibration: Keep Current Create New Read From File
< Back
Next >
Cancel
Help

18. Select "Create New" Energy and Efficiency Calibration: this will automatically "destroy" the old calibration.



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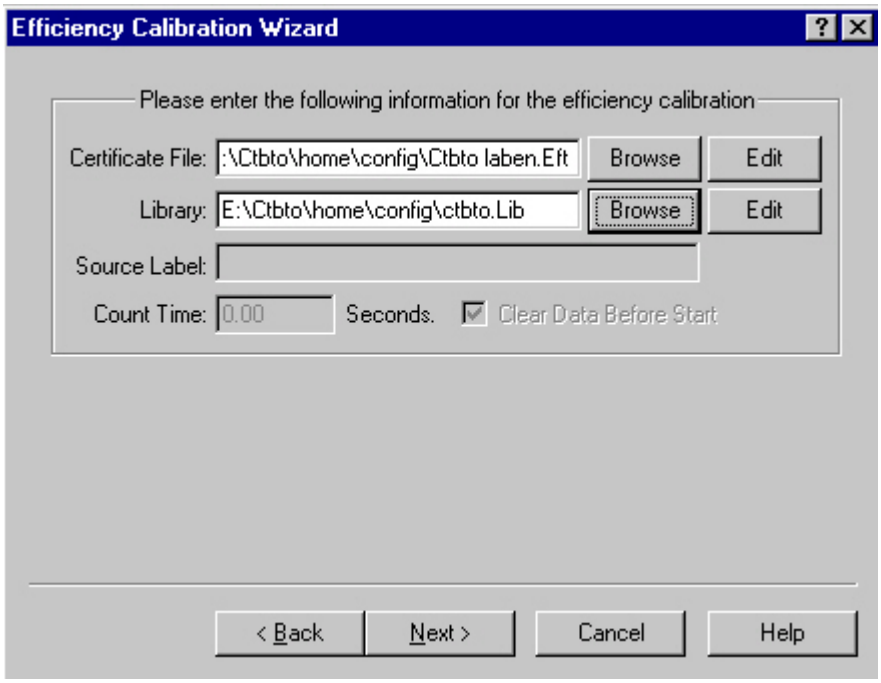
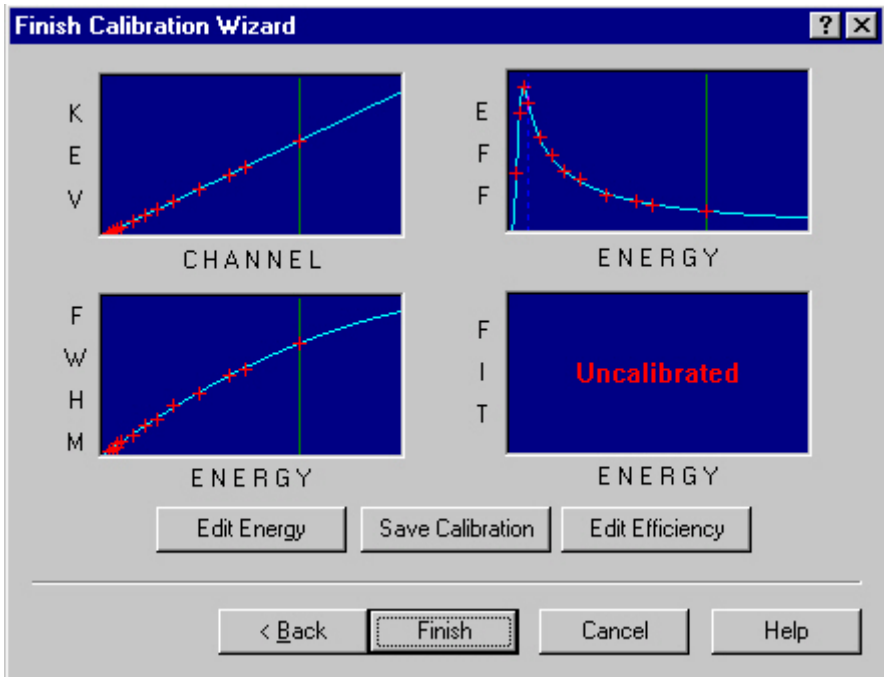
19. Select the nuclide library to use for the energy calibration (ctbto. lib).



20. Select the certificate file for the efficiency calibration (i.e. NOP49.eft).

21. You will see on the next screen already the result of the calibration.



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22. If some points are off the fitting curve, go back and check the efficiency/energy values in the files.

23. If everything looks fine press Finish and the calib pairs are used in the spectrum.

24. Save the spectrum in d:\user with name “calibration YYYYMMDD” where YYYYMMDD is the current date.

25. Return to the detector display (see point 16)

26. From Calibrate menu select Recall Calibration and select the previously saved calibration file.

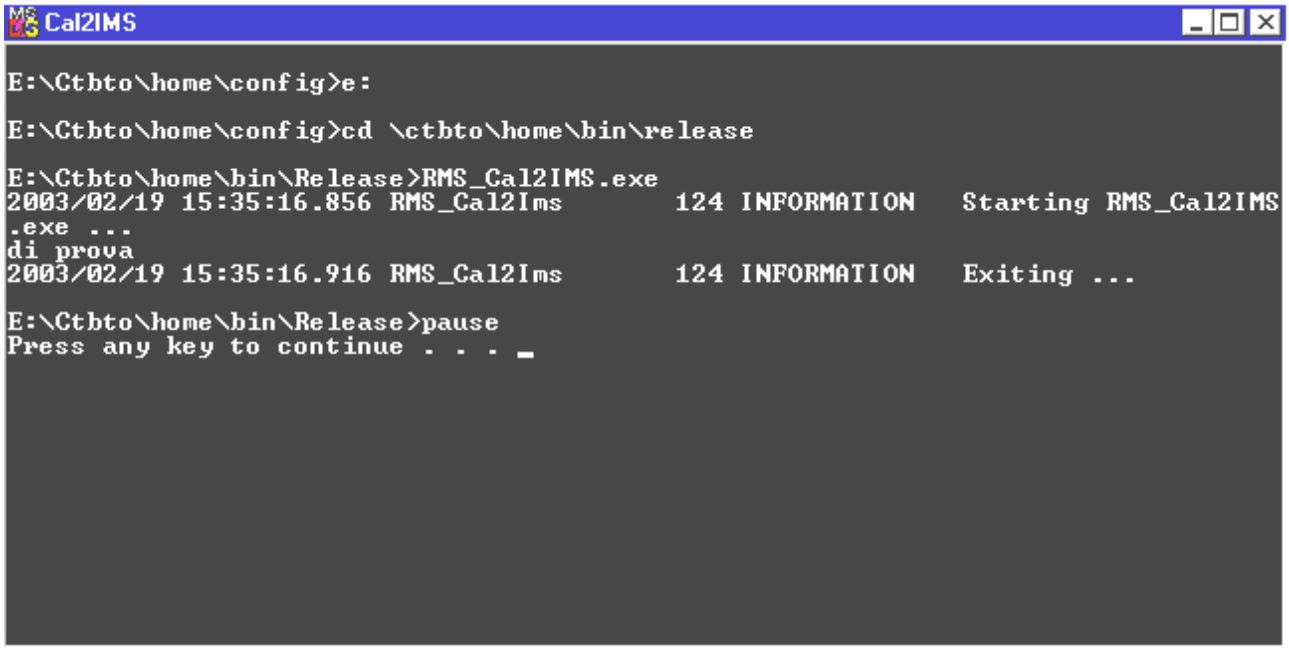
Conversion from MCA calibration file to IMS ready calibration file:

27. At the end of a calibration phase choose *Calibrate* menu / *print calibration* and check *print to file*.

28. Browse the destination to: **E:\Ctbto\home\config** directory with **Calibration.txt** file name.

29. Click on desktop icon named “Cal2IMS”

30. A Terminal window opens: verify that no error is displayed and press any key



31. Return on the Operator interface and select “Save” from the calibration section.

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32. Restart pump by pressing F3

33. Change to Automating Mode by pressing F2

34. Record action taken in Operation Log.

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APPENDIX D: BLANK FILTER PROCEDURE

Note: This procedure is to be started just before the normal daily filter change.

1. Prepare a blank sample. Insert a new filter into an empty cassette.

2. Label the blank with the appropriate SRID.
   (see Operational Procedure IMS-XXP**-011 *Barcode Printing*).
   ** Station identifier

3. Introduce the cassette into the tray at the left side of the ARAME system in the second position from the top.

4. Once the **normal filter cycle is completed** (after the QC measurement), Log on in the ***Operator Interface*** as operator (see ARAME User's Manual)

5. Open the ***Detector Window*** and stop the acquisition

6. Press F1 to put the ARAME system in MANUAL mode.

7. Press F3 to stop the pump

8. Press F5 to produce a filter change, a new filter cassette (blank) will be loaded

9. Open the plexiglass cover and take out the recently extracted filter cassette with the SRID of the day.

10. Insert the filter cassette again on top of the left-side tray

11. Once filter change is completed press F3 then press F1 (AUTOMATIC) and then again F5.
    Note: The pump has to be ON, to enable the operator to place the system in AUTOMATIC mode.

12. The blank filter is cut and placed in the beaker. Press F4 to Reset the ARAME system, then F1 for MANUAL mode and then F2 to close the shield (because of the Reset).

13. Press F2 to open the lead shield

14. Open the Plexiglas cover and remove any sample from the detector chamber

15. Place the blank on the detector.

16. Place the sample, which was in the detector on its decay position and put an new beaker on the empty "used cassette cover" position (this position was occupied by the blank).

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17. Close the Plexiglas cover

18. Press F2 to close the shield

19. From the ***Operator Interface*** open the ***Maintenance Window*** by clicking the first icon on the left top of the window.

20. Write the acquisition time in the field ***Last procedure programmed time****.* Make sure that the time is set in hours (e.g., 24:00 for a 1-days blank acquisition time).

21. Select the ***Start Procedure*** button in the ***Blank Filter Section***
    Answer NO, when asked to save the last spectrum.

22. Once the programmed time elapsed, the acquisition will stop automatically, the spectrum will be automatically saved, converted into IMS format and sent to the IDC

23. Check if the blank spectrum was sent. Follow the ARAME User's Manual to find the corresponding text file. If for any reason the spectrum was not saved, return to the Operator Interface and press *SAVE.*

24. Press F1 to put the ARAME system in AUTOMATIC mode.

25. In the *Maintenance Window*, press AUTOMATIC (the system will be placed in AUTOMATIC mode and ready to start a normal spectrum)

26. Go to the ARAME board and press F1 to return to Manual Mode.

27. Press F2 to open the shield and take out the blank

28. Put the 24h-decayed sample in the detector

29. Press F2 to close the shield

30. Return the ARAME system to automatic mode by pressing F1

31. Complete the Operation Log.

Note1: if you don't set any acquisition time in STEP 16, you should stop the acquisition manually and then press the ***SAVE*** button in the ***Maintenance Window***. On doing so, the spectrum will be saved, converted to IMS format and sent to the IDC. Failure to press the ***SAVE*** button will cause the loss of the spectrum.

Note2: For the next sample measurement there will be no previous QC-source measurement.

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APPENDIX E: BACKGROUND PROCEDURE

4. Log on the operator interface as operator
5. Open the detector window and stop the acquisition
6. Choose to send the spectrum
7. Set Cinderella in Manual Mode (push F1 in the Cinderella command display panel. The led “manual” must flash).
8. Stop the pump (F3)
9. If requested, remove the check source
10. Open lead shield (F2)
11. Remove the beaker from the detector.
12. From the Operator Interface open the “Maintenance window” by clicking the first icon on the top-left of the main window.
13. Set the acquisition time writing 168:00 in the field “last procedure programmed time”.
14. Select the “Start procedure” in the Background section

… After 7 days the system will stop the acquisition of the spectrum

15. Return on the Operator interface and select “Save” from the Background section
16. Restart the pump (F3)
17. Set Cinderella in automatic mode (push F1. The green led becomes fixed)

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APPENDIX F: PERIODIC DATA BACKUP

The station PC is provided with a CD recorder. Incremental backups are done on CD-R 650MB. For the first backup insert a new CD, next ones will be made on the same multisession CD until it is full.

How to make the periodic data backup:

1. insert the CD-R in the drive
2. Select: program files > Ahead > Nero burning ROM
3. Nero wizard window appears, chose Compile a new CD, press next
4. now chose Data CD, then press next
5. if you inserted a new blank CD chose new data CD. If the CD already contains previous backups, chose Continue with existing Data CD. Press Next, then Finish.

… if you inserted a new blank CD:

6. Using the right file browser window go to the `\ctbto\home\archive` folder
7. Drag the archive folder to the root folder of backup CD:

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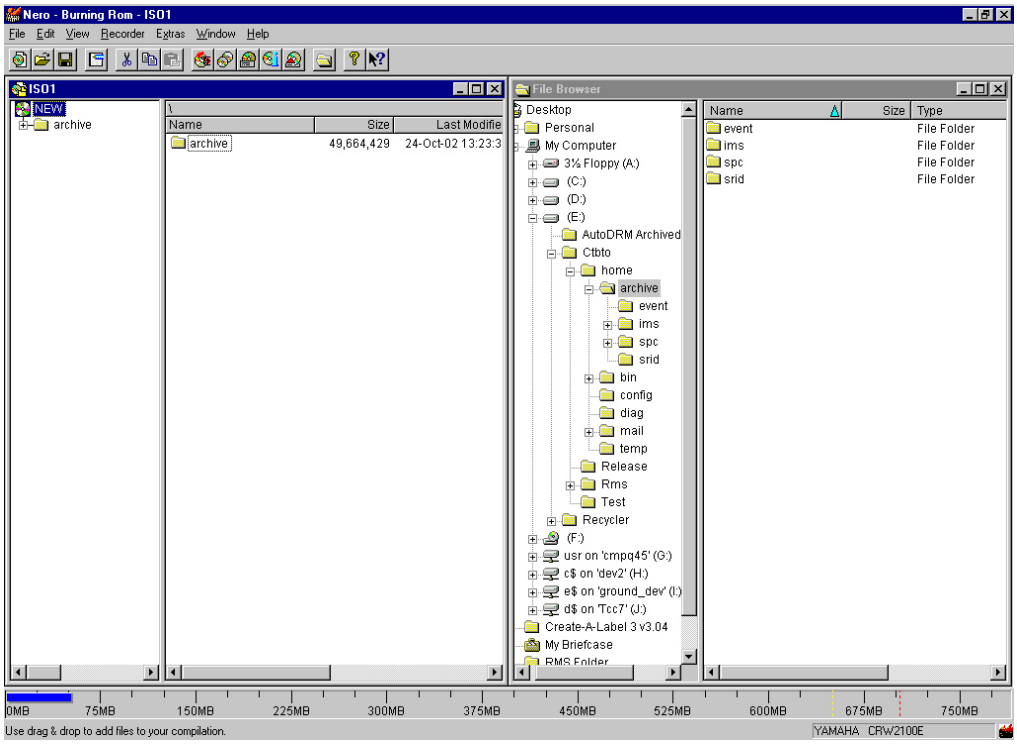

8. Select file - Burn CD
9. Chose Burn
10. At the end of burn process exit Nero.

… if CD already contains previous backups:

6. Chose the last track to continue multisession
7. The software calculates how many files has been added/modified in the archive folder since last backup. Confirm with OK
8. Select file - Burn CD
9. Chose Burn
10. At the end of burn process exit Nero.

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APPENDIX G: SYSTEM BACKUP AND RECOVERY

Creating a system backup on CD:

Required for this procedure:
Norton Ghost bootable floppy disk, a set of blank CD-R (see point 1 and 2).

1. Using file explorer check the used space on Hard Disk 1 (sum of drives c and d).
2. Prepare a set of CD-R. The number of CD needed must be consistent with the data to be stored as calculated in point 1. Usually 5 CDs cover the total amount of data. However, if compression is used, only 3 CDs probably will be required.
3. Insert a blank CD in the CD recorder.
4. Reboot the PC from the floppy. If the PC does not boot from floppy disk, then go to the BIOS setup and set floppy as first boot drive.
5. The Norton Ghost software loads automatically.
6. A welcome window appears. WRITE THE LICENCE NUMBER DISPLAYED IN THE WINDOW ON THE COVER OF THE FIRST CD OF THE SET. Write down also the date of backup and a short description if needed. Then Click OK.
7. From the drop down menu select: Local > Disk > To Image
8. A list of hard disk drives present on the system appears: select Disk 1.
9. A dialog windows titled “File name to copy image to “ is displayed: select the CD-R drive, then click SAVE.
10. In the dialog box chose Fast compression.
11. in the next dialog, select “write a bootable floppy” then click YES
12. At the warning “Proceed with drive backup ?” click YES.
13. Confirm with YES. The backup operation will start.
14. During backup operation, the software will ask for the following CDs. Always write the progressive number of CD both on the disk and on the cover.
15. At the end remove the floppy and reboot the PC.
16. Archive the CD set and the Norton Ghost floppy in a safe place. Each CD should have the date of backup and progressive number in the format “Disk 1 of 3” written on it.

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Hard Disk recovery from CD:

Required for this procedure:
Norton Ghost bootable floppy disk, a set of CD containing the hard disk image.

1. Insert first CD of the recovery CD set
2. Insert the recovery Floppy disk
3. Reboot the PC. If the PC does not boot from floppy disk, then go to the BIOS setup and set floppy as first boot drive.
4. The Norton Ghost software loads automatically.
5. A welcome window appears. Click OK.
6. From the drop down menu select: Local > Disk > From Image
7. A dialog appears with title “File name to load image from”. In the drivers drop down menu select CD ROM.
8. The name of the image file (.gho) stored on CD appears in the window along with a short description. Select the image file.
9. The software prompts for the licence number: enter the code written on the cover of the first CD of the set.
10. A list of the hard disk drives available in the system appears: select Drive 1.
11. A list of the partitions to be restored appears with two partitions listed: click OK.
12. To proceed with recovery click OK. The software will ask for the following CDs during the recovery operation.
13. When the recovery is finished, reboot the computer.

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APPENDIX H: ENDCAP-SAMPLE DISTANCE MEASUREMENT

Introduction

This procedure has to be used:

- after any detector servicing that requires the removal of the detector from the Airsampler
- after the substitution of the plastic sample holder inside the lead shield.

Required tools

A gauge

Procedure

1. Put the Airsampler in manual mode pressing F1
2. Press F2 to open the lead shield
3. Remove the sample container (beaker) from the sample holder
4. Ensure that the detector endcap is well centered within the shield walls. If the alignment is poor, act on the endcap with small movements. It is also possible to insert small wedges from below the Cinderella, between the detector and the lead shield.
5. Measure the distance between the point where the bottom of the beaker touches the sample holder and the endcap. To make this measuement use the tail of the gauge as described in figure 34. Repeat the measurement for each of the four corners of the beaker holder (points 1,2,3,4 in figure 32).
6. Put the beaker back into place
7. Press F2 to close the shield
8. Put the Airsampler back in automatic mode pressing F1

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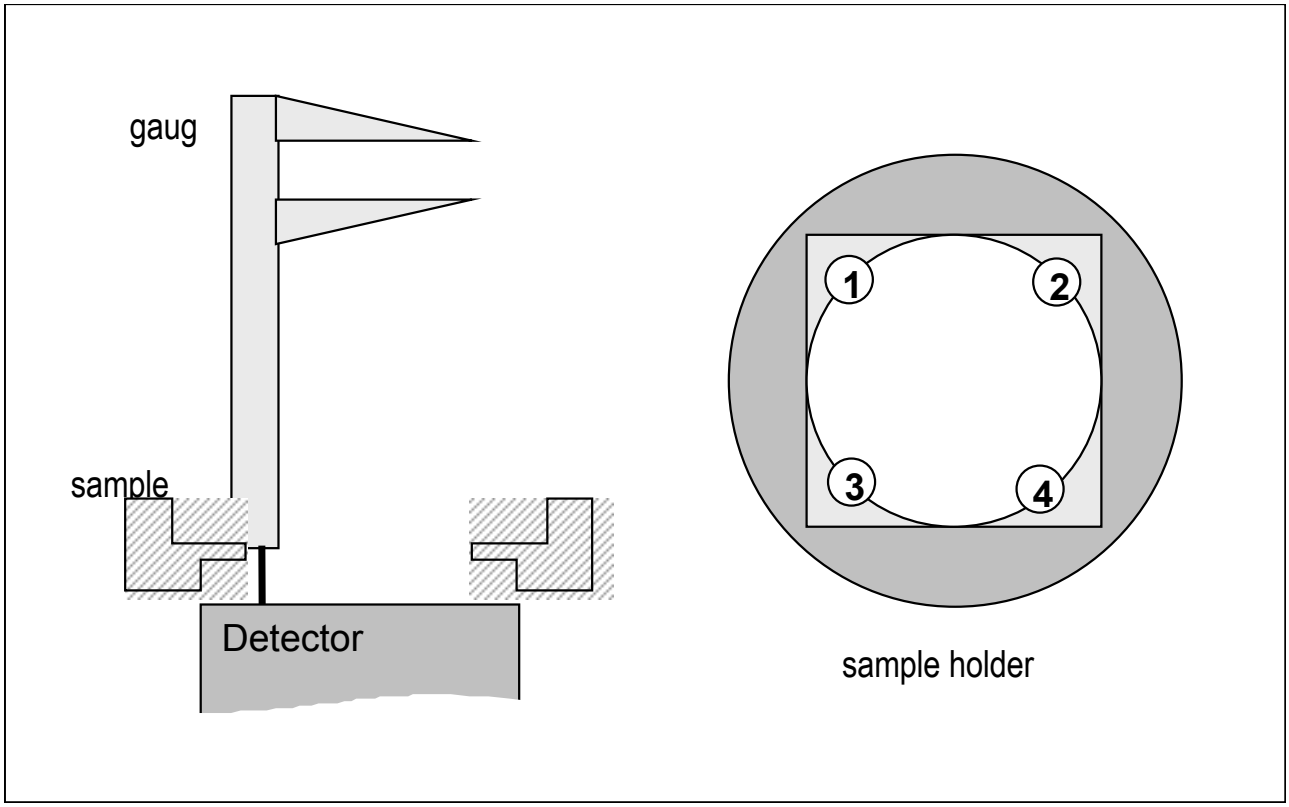

Figure 32. Endcap-sample distance measurement

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APPENDIX I: NEW CERTIFICATE FILE CREATION

When the Calibration or QC source is replaced by a new one, a new certificate file should be compiled. The information needed for the certificate file are extracted from the Source certificate assay that comes with the source pakage.
The certificate files are in the `\ctbto\home\config` folder:

`ims_certificate.txt` for calibration source
`qc_certificate.txt` for QC source

They can be modified with a text editor. Table 9 explains the format that must be followed compiling the new certificate file. An example of certificate file is reported below. It is suggested to edit the old certificate updating it to the new one rather than create a new file.

```
#Certificate
36105      2001/05/01 12:00:00.0

Am-241   157850 D      3340.000 3.000   59.540   35.900  0 0        0
CD-109   462.2 D       16500.00 3.000   88.037   3.620   0 0        0
CO-57    271.83 D      598.000  3.000   122.060  85.600  0 0        0
CE-139   137.66 D      607.000  3.000   165.860  79.900  0 0        0
HG-203   46.604 D      630.000  3.000   279.200  81.460  0 0        0
SN-113   115.09 D      2033.000 3.000   391.690  64.890  0 0        0
SR-85    64.849 D      1680.000 3.000   514.010  98.400  0 0        0
CS-137   11000 D       3130.000 3.000   661.660  85.000  0 0        0
Y-88     106.630 D     3990.000 3.000   898.040  94.000  0 0        0
CO-60    1925.3 D      3600.000 3.000   1173.200 99.850  0 0        0
CO-60    1925.3 D      3600.000 3.000   1332.500 99.980  0 0        0
Y-88     106.630 D     3990.000 3.000   1836.100 99.330  0 0        0
```

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Record	position	format	description
1	1-15	a15	#Certificate
2	1-10	i10	total source activity (Bq)
	12-21	yyyy/mm/dd	assay date
	23-32	hh:mm:ss.s	assay time
3-n	1-8	a8	nuclide name
	10-22	a13	half life secs hours, days or years (S, H, D, Y)
	24-31	f8.3	activity of nuclide at time of assay (Bq)
	33-39	f7.3	uncertainty (Bq)
	41-48	f8.3	gamma energy (KeV)
	50-56	f7.3	gamma intensity (%)
	58	a1	0
	60-67	f8.3	0
	69-75	f7.3	0

Table 9. Certificate file format. The format specifiers are a=text, i=integer, f=floating point. The specifiers are followed by the precision. Note that 1 µCi = 37000 Bq.

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APPENDIX L : FILTER CRASH RECOVERING PROCEDURE

If automatic filter substitution fails, due to filter tray block, it is necessary to operate manually. After the filter cutting the robot arm try to push the last cassette into the “used cassette tray ". When the system is blocked, the arm stops immediately and “X-over current” message appairs on Cinderella display. The ARAME system continues its routine, the shield is open and the QC measurement starts.
→ It is necessary shift by hand the cassette into “used cassette tray”.
→ By pressing F4 the unit was reset causing the robot arm to return to the starting position. The Beaker number was not changed after the reset, while the measured sample was still on the detector.
The procedure to be carried on by the operator is the following:

1) Remove the blocked filter
2) Verify that no damnage occurred in Cinderella
3) Manually change the beakers to restore the correct sequence and close the plexi cover
4) Press F4 to reset the system
5) Press F1 to place ARAME in MANUAL mode - Shield closes automatically
6) Press F1 to return ARAME in AUTOMATIC mode - Sample measurement starts automatically

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